
A SYSTEMATIC REVISION OF *Fuchsia* SECT. *QUELUSIA*
(ONAGRACEAE)¹ Paul E. Berry²

ABSTRACT

Fuchsia sect. *Quelusius* consists of nine closely related species, eight from southeastern Brazil and one from southern Chile and Argentina. This treatment recognizes *F. alpestris* and *F. glazioviana* as separate from *F. regia* and describes two new species from southern Brazil, *F. brevilobis* and *F. hatschbachii*. The section is defined by its shrubby-lianoid habit, opposite-whorled leaves, and distinctive floral pattern associated with hummingbird pollination. It is one of only two entirely polyploid sections in the genus. Unique characters of the section include the large, violet, convolute petals, strongly exerted stamens, and partially connate sepals that are longer than the floral tubes. All nine species occupy cool forest habitats that are remnants of the widespread Tertiary temperate forests of the Southern Hemisphere. With the Old World sect. *Skinnera* as the sister group of all the American species of *Fuchsia*, sect. *Quelusius* represents an early offshoot of the ancestral South American fuchsias, distinct from the tropical Andean and Central American sections in its polyploidy and derived, 3-porate pollen. The nearest relative and sister species of sect. *Quelusius* is *F. lycioides*, a specialized xerophyte and the sole member of sect. *Kierschlegeria*, which occurs in central Chile just north of the range of *F. magellanica*. The Andean and Brazilian populations of sect. *Quelusius* probably became isolated in the late Tertiary, when the austral temperate forests were broken up by increasing aridity to the east of the Andes, as these were strongly uplifted. While *F. magellanica* has not differentiated substantially throughout its range in the southern Andes, sect. *Quelusius* has radiated extensively in the subtropical mountains of southern Brazil, where five of the eight species are restricted to high, isolated mountain peaks. *Fuchsia regia*, on the other hand, is widespread at lower altitudes throughout the planalto and coastal mountains of southeastern Brazil; it is differentiated into three mostly allopatric but intergrading series of populations which are treated here as subspecies. Two of these subspecies are newly described, *F. regia* subsp. *reitzii* and *F. regia* subsp. *serrae*. *Fuchsia regia* is the only species now found to occur sympatrically with other members of the section, and it forms natural hybrids with at least five different species. The only naturally occurring octoploid populations in the genus occur in *F. regia* and appear to be recently derived.

Fuchsia is a distinctive genus of Onagraceae with close to 105 species belonging to ten sections (Berry, 1982; Berry et al., 1988). The genus consists mostly of mesic shrubs confined to cool, moist habitats, with nearly ¾ of the species concentrated in the tropical Andes. The remaining species occur in Mexico and Central America, Hispaniola, southeastern Brazil, the southern Andes, New Zealand, and Tahiti.

In recent years, *Fuchsia* has been the subject of a series of studies designed to refine the taxonomy and to improve our understanding of the evolutionary relationships within the group. A comprehensive analysis of leaf flavonoids (Averett et al., 1986) confirmed the distinctiveness of the New Zealand species of the widely disjunct sect. *Skinnera* from their American congeners. Studies of pollen morphology and ultrastructure in a broad

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array of species have helped to define sectional limits by detecting consistent differences in viscin thread types, aperture number, and grain size (Skvarla et al., 1976, 1978; Nowicke et al., 1984; Pragłowski et al., 1983). Systematic revisions for seven of the ten sections in the genus have been completed, based on broad cytological surveys, a thorough review of the major collections of herbarium specimens, and extensive field examination of natural populations (Breedlove, 1969; Berry, 1982, 1985; Breedlove et al., 1982; Berry et al., 1988). The present study uses the same methodology to produce a revision of the species of sect. *Quelusia*, a group centered in southeastern Brazil and forming the largest section outside of the tropical Andes.

A better understanding of the systematics of sect. *Quelusia* is particularly desirable, as the species form a closely related, yet unspecialized group that may have retained many of the primitive characters of the genus. Biogeographically, the section is confined to ancient forest areas in the southern Andes and in southeastern Brazil that show clear austral-Antarctic affinities. Ultimately, this may have been the source area from which other sections differentiated and spread both to Australasia, when more or less direct overland connections were possible across Antarctica until the mid-Tertiary, and to Central America, where several small sections presently occur.

Horticulturally, most of the hundreds of hybrid *Fuchsia* cultivars have been derived primarily from members of sect. *Quelusia* (Reiter, 1944), yet there has been much confusion as to which taxa were involved in the early crosses. Accurate information on the different native species of sect. *Quelusia* can also be expected to stimulate interest in their preservation, cultivation, and use in hybridization for new ornamental cultivars.

In the only recent monograph of *Fuchsia*, Munz (1943) recognized five species in sect. *Quelusia*, together with *Fuchsia hybrida* Hort. ex. Vilm., a name used to encompass most of the common garden hybrids. *Fuchsia magellanica* and *F. regia* included three and four varieties, respectively; these species have the broadest geographical distributions in the genus and also show complex patterns of morphological variation. In this study, *Fuchsia magellanica* is treated as a single, cytologically uniform, polymorphic species with no clear geographical pattern of differentiation. *Fuchsia regia*, on the other hand, has tetraploid and octoploid populations, with geographically differentiated variants that are treated here as comprising three intergrading subspecies. Both *F. alpestris* and *F.*

glazioviana are reinstated as distinct species, and two previously unrecognized species are described, *F. brevilobis* and *F. hatschbachii*. As herein delimited, sect. *Quelusia* consists of 11 taxa, with nine different species.

HABITAT AND DISTRIBUTION

Fuchsia sect. *Quelusia* is an entirely Southern Hemisphere group of species, with a latitudinal range extending from 18°S to 55°S. It occurs in South America in two large but widely disjunct areas: the southern, temperate Andes of Chile and Argentina, and the coastal mountains and high plains of southeastern Brazil (Fig. 1).

The only species occurring in the southern Andes is *F. magellanica*, which is characteristic of the wet, temperate, Valdivian forests that are centered in the Región de Los Lagos of Chile. These forests are considered to be relicts of an ancient vegetation type that includes many taxa of Australasian affinity, such as *Nothofagus*, *Drimys*, *Podocarpus*, and *Araucaria* (Rambo, 1951; Hueck, 1972; Lötschert, 1981). *Fuchsia magellanica* also extends farther north into drier areas in Chile, where it occurs in moist microhabitats as far north as Santiago and Valparaíso, and then southward to the subantarctic scrub forests of Tierra del Fuego. Throughout its range, *F. magellanica* occurs as low as sea level, but only at its northernmost range does it reach its upper altitudinal limit of 1,750 m. Seasonality increases southwards, so that in Tierra del Fuego, flowering is restricted to the summer months of December to March, and plants are strongly deciduous in the freezing winter months.

The other eight species of the section all occur in the highlands of southeastern Brazil. A single species, *F. regia*, is widespread and covers the entire range of the section in Brazil, from 18°20'S to 29°30'S. The remaining species have much more restricted distributions, several occurring on a single mountain range.

Fuchsia regia consists of three largely allopatric subspecies. Subspecies *serrae* occurs mainly in dense cloud forests at the crests and on the seaward-facing escarpments of the coastal mountains from Rio Grande do Sul to northern São Paulo state, at elevations of 500–1,450 m. In Santa Catarina, however, it is also found in enclaves of montane vegetation on the summits of the isolated “morros” that emerge just 100 to 300 m above the Atlantic lowland forest in the Itajaí Valley (Klein, 1978). It has also been found at sea level in restinga forests near the Santa Catarina–Rio Grande do Sul border,

where Reitz (1961) found a number of other plants typical of the high inland serras.

Fuchsia regia subsp. *reitzii* is restricted to thickets and low forest on the drier planalto, or southern highlands, that occupies much of the interior of Paraná, Santa Catarina, and Rio Grande do Sul. It occurs at altitudes between 900 and 1,700 m in areas subject to strong winter frosts (Klein, 1984). The range of subsp. *reitzii* in this area coincides quite closely with *Araucaria angustifolia*, the dominant element of the planalto forests (Hueck, 1953). In Rio Grande do Sul and southern Santa Catarina, the planalto ends abruptly to the east at the "Aparados" or "Taimbés," sheer cliffs that drop down hundreds of meters to the Atlantic coastal plains. At these sites, subsp. *reitzii* reaches its eastern limit, growing sympatrically along a narrow band with the westernmost populations of subsp. *serrae*.

Fuchsia regia subsp. *regia* occurs further north in a series of separate mountain systems, from northern São Paulo to Rio de Janeiro, Minas Gerais, and Espírito Santo. It grows in cloud forests beginning at 1,000 m and reaches open campos above treeline as high as 2,400 m on Mt. Itatiaia.

Several species are restricted to high altitudes and are known from just one area. *Fuchsia bracedlinae* grows only between 2,300 and 2,850 m, above treeline in the "campos de altitude" of a few peaks of the Serra do Caparaó. This is the highest mountain range of southern Brazil, situated along the Minas Gerais–Espírito Santo border. Similarly, *F. campos-portoi* occurs only in campos around Mt. Itatiaia, in the Serra da Mantiqueira, between 2,100 and 2,550 m. *Fuchsia coccinea* occurs naturally only at the summit of four of the highest mountains in Minas Gerais, between 1,400 and 2,000 m.

Two species are endemic to several of the high, granitic "morros" characteristic of the Serra do Mar in Rio de Janeiro state. *Fuchsia alpestris* grows among bushes at the base of granitic outcrops in the Serra dos Órgãos and around Santa Maria Madalena. *Fuchsia glazioviana* is found as high as 2,100 m in open campo vegetation on morros around Nova Friburgo and Santa Maria Madalena. It also descends into cloud forest as low as 1,500 m on the same mountains.

Two newly described species from Paraná and southern São Paulo states have broader ranges. *Fuchsia brevilobis* occurs in forests of low, inland mountain ranges at 600–900 m, but on the eastern slopes of the Serra do Mar in Paraná, it is found from 400 m to sea level. *Fuchsia hatschbachii* occurs further inland in Paraná, in drier forests

than the coastal mountains, and is apparently restricted to limestone and sandstone outcrops between 950 and 1,150 m.

REPRODUCTIVE BIOLOGY

The members of sect. *Quelusia* all conform to a very similar pattern of floral biology. The flowers are hermaphroditic and self-compatible, as well as protogynous and herkogamous. Consequently, the genus has been characterized as "modally outcrossing" (Raven, 1979a). Blossoms are always pendent, with the stigma exerted well below the anthers, a prime example of "approach herkogamy" (Webb & Lloyd, 1986), where the stigma is contacted as the visitor enters the flower prior to picking up pollen. Protogyny is incomplete, however, because the anthers begin to dehisce within a day after anthesis, while the stigmas remain receptive from the onset of anthesis until flower senescence several days later. Despite the presence of these outcrossing mechanisms, geitonogamous pollen transfer may still lead to effective selfing. Automatic selfing can also occur, since pollen usually hangs down in clumps joined by viscin threads, which are able to contact the stigmatic surface before the flower senesces.

The flowers of sect. *Quelusia* are highly specialized for pollination by hummingbirds. Each species has red, odorless, hanging, tubular flowers with copious nectar secreted at the base of the floral tube, all standard features in hummingbird-pollinated plants (Faegri & van der Pijl, 1979). Unlike other bird-pollinated fuchsias, however, the petals are much larger and strongly convolute; they thus act functionally as a prolongation of the floral tube, further restricting the access of insects to the nectary. The deep blue-violet color of the petals of sect. *Quelusia* is unique in the genus, although its significance in pollination is not clearly understood. The abundance of viscin threads in *Fuchsia* is among the most copious in the family and has been considered a probable adaptation to bird pollination (Nowicke et al., 1984).

Hummingbirds are commonly observed visiting the flowers of sect. *Quelusia* throughout its native range, but few published accounts have identified the species of the hummingbird visitors. Curtis (1836) cited an early account by J. Anderson, the botanist on Philip King's voyage to the Magellan Straits, who observed numerous hummingbirds visiting *F. magellanica* around Port Famine, even after days of constant rain and sleet at near-freezing temperatures. Hauman-Merck (1912) reported frequent visits of *Eustephanus galeritus* (Mol.) on

F. magellanica near Corral, in Valdivia, Chile. In Brazil, Ruschi (1982) reported *Colibri serrirostris* (Vieillot) visiting flowers of *F. regia*. A Plovercrest hummingbird, *Stephanoxis lalandi* (Vieillot), was observed visiting *Fuchsia* in the open campos area of Mt. Itatiaia, Rio de Janeiro state by Mitchell (1957), as well as by Ruschi (1982) in Teresópolis at 900 m. Three hummingbird species, *Colibri serrirostris*, *Stephanoxis lalandi*, and *Leucochloris albicollis*, were common around *F. bracedinae* in the Serra do Caparaó, at 2,400 m, during a visit in February 1985 (L. Gonzaga, pers. comm.). It is unlikely that any strong pollinator discrimination exists between the different species of *Fuchsia* in Brazil, since the flowers are very similar in size and overall floral pattern. On both *F. campos-portoi* and *F. brevilobis*, I have seen two different hummingbird species visiting flowers of the same bush in rapid succession, and I also watched an individual hummingbird visit flowers of *F. brevilobis* right after leaving flowers of a neighboring plant of *F. regia* subsp. *serrae*.

Besides hummingbirds, several insect species have also been observed visiting flowers of sect. *Quelus* in their native habitat. *Apis mellifera* was a common visitor to flowers of *F. coccinea* at Serra da Piedade, Minas Gerais, during our visit in February 1985; it was also observed on *F. campos-portoi* at Mt. Itatiaia in January 1985. Hauman-Merck (1912) described the visits of *Bombus chilensis* to *F. magellanica* in southern Chile, and thought it to be a more important visitor there than hummingbirds. Both of these bee species hang from the anthers to collect pollen and may attempt to reach the nectary at the base of the tube; *Bombus*, especially, is able to make contact with the stigma and acts as an effective pollinator. I also saw a butterfly visiting *F. regia* subsp. *serrae* near Mogi das Cruzes, São Paulo, Brazil; it grasped the stamens attempting to enter the floral tube for nectar and made contact with both the anthers and the stigma in the process. When species of sect. *Quelus* are cultivated outside their native range in areas where hummingbirds do not occur, such as England, they are frequently visited by honey bees and bumblebees (J. Wright, pers. comm.).

Seed dispersal is probably effected by frugivorous birds, although no direct observations or published reports have been made.

MORPHOLOGY

Habit and stems. Plants of sect. *Quelus* are all shrubs or lianas. Stems are usually flexuous and require the support of neighboring vegetation, but

low, densely branched shrubs are common in such species as *F. coccinea* and *F. bracedinae*. *Fuchsia regia* can become a large, forest liana, with stems to 20 cm in diameter climbing as high as 15 m into the tree canopy, but it can also be found growing as a compact shrub in open situations. On large, climbing plants of *F. regia* and *F. alpestris*, it is common to find hanging branches several meters long. Short, divaricating side shoots are typical of young plants of *F. regia* subsp. *serrae*.

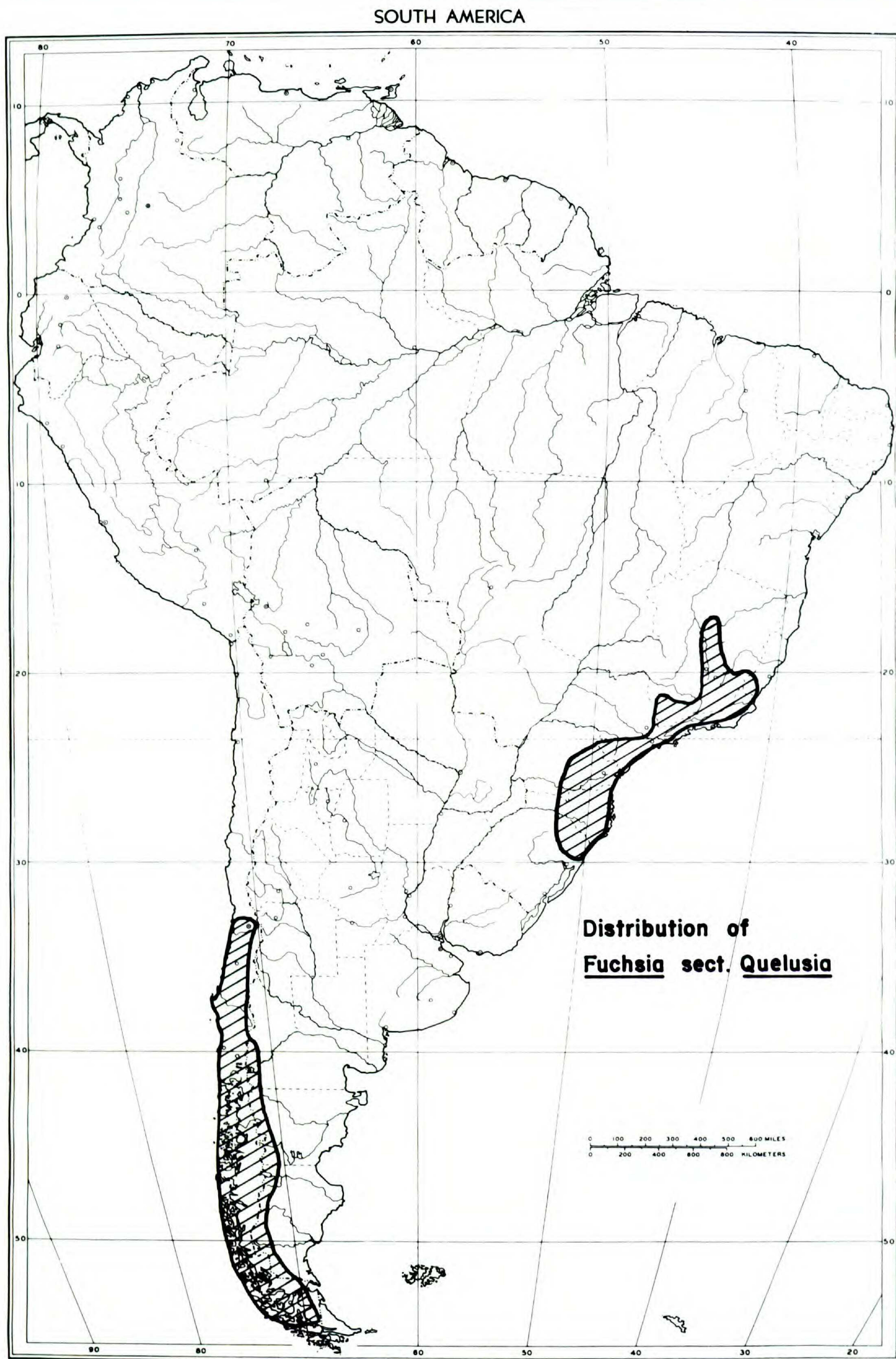
Vegetative reproduction occurs in most taxa through stem-layering, especially when long, flexuous stems lay over ground litter. *Fuchsia bracedinae* and *F. coccinea* reproduce locally by underground, stoloniferous stems, and some populations of *F. regia* subsp. *serrae* produce aerial roots on shoots well above the ground, as described by Lindley (1841) for *F. radicans*.

Leaves. Phyllotaxis in sect. *Quelus* is opposite or whorled. The most common condition in the section is ternate leaves, but individual plants often combine leaves in pairs, threes, and fours on different shoots. Exceptions are *F. alpestris*, almost always with opposite leaves, and *F. regia* subsp. *reitzii*, with leaves all in whorls of 3, 4, or 5. *Fuchsia glazioviana* has unusually short internodes, just 3–12 mm long, with the leaves densely packed on the stems.

The texture of the leaves of most species is membranous, but *F. regia* subsp. *serrae* has coriaceous leaves, and those of *F. regia* subsp. *regia* are mostly subcoriaceous. Leaf surface is a useful character in some taxa; it is smooth and lustrous in *F. regia* subsp. *serrae*, with a dark green color above and a paler tone below. Leaf surfaces of *Fuchsia glazioviana* and *F. hatschbachii* are similar, but the surface is less brilliant. Impressed leaf veins are especially characteristic of *F. bracedinae*, and to a lesser degree in *F. brevilobis*. Secondary venation in leaves of *F. campos-portoi* can be almost imperceptible, while in *F. regia* subsp. *reitzii* a conspicuous tertiary venation is usually evident.

Leaf size and shape vary considerably within taxa, but some differences can be readily distinguished. The leaves of *Fuchsia glazioviana*, *F. bracedinae*, and *F. campos-portoi* are small, mostly less than 4 cm long, and very narrow in *F. campos-portoi*. The largest leaves occur in *F. alpestris* and *F. regia* subsp. *regia* and are mostly 6–14 cm long. Ovate leaves with cordate bases are diagnostic of *F. coccinea*.

Leaf margins are characteristically gland-denticulate, but in *F. campos-portoi* and *F. regia*

FIGURE 1. Native distribution of *Fuchsia* sect. *Quelusia*.

subsp. *reitzii* they are conspicuously gland-serrulate, with the teeth angled towards the leaf apex. *Fuchsia magellanica* has mostly serrulate margins, but they are sometimes crenate, with shallow lobes between the teeth.

Petiole length is useful in discriminating taxa in sect. *Quelus*. *Fuchsia coccinea* and *F. brachyloba* have nearly sessile leaves, with petioles 1–3 mm long, while they exceed 10 mm in *F. regia* subsp. *regia* and *F. regia* subsp. *serrae*. Often the proportion of the petiole to the blade length is very informative: high ($> 1:4$) in *F. regia* and *F. magellanica*, and low ($1:8 <$) in *F. hatschbachii* and *F. alpestris*. Petioles are stout and over 1 mm thick in *F. alpestris*, *F. coccinea*, *F. regia* subsp. *serrae*, and *F. regia* subsp. *regia*; they are slender in *F. magellanica*.

Stipules in all but one taxon are small, lanceolate, and deciduous. *Fuchsia regia* subsp. *serrae* is unique, with prominent, persistent stipules that are thick and recurved, usually fused in pairs between adjacent leaves, and give a characteristic nodose appearance to the stems.

Flowers. Flowers are all borne singly or rarely in pairs in the axils of young leaves near the branch tips. Rarely more than two or three whorls of leaves bear flowers at the same time on a single stem. The pedicels are pendulous, except in *F. coccinea*, where they are divergent from the stem before hanging down in the distal half.

Section *Quelus* is the only group in the genus where the sepals are much longer than the floral tube. In addition, the sepals are always connate to varying degrees at their base, which in effect lengthens the tubular portion of the flower. The petals are strongly convolute and form a cone around the stamens and stigma. The nectary consists of a smooth to slightly lobed band ca. 1 mm thick lining the inner, basal portion of the floral tube. A flower from sect. *Quelus* is illustrated diagrammatically in Figure 2.

The floral tubes of most species are cylindrical-fusiform, but *F. campos-portoi* is distinct with its short, subrhombic tubes. Sepal connation is only 3–6 mm in most taxa. *Fuchsia brevilobis* is exceptional, with sepals connate for 10–16 mm, almost completely concealing the corolla and longer than either the free sepal lobes or the true floral tube. *Fuchsia regia* subsp. *serrae* also has sepals joined for over $\frac{1}{3}$ their length; the buds are noticeably four-ridged, and the free lobes sometimes recurve after anthesis.

Fruits. Berries in sect. *Quelus* are generally oblong-ellipsoid and dark purple to black when ripe.

In *F. regia* subsp. *reitzii*, the berries are mostly globose, while in *F. magellanica* they are much more elongate than in the other species. Ovules are biseriate in each locule and number between 60 and 120 per fruit.

CYTOLOGY AND PALYNOLOGY

Cytology. Concurrently with this revision, Hoshino & Berry (1989) made an extensive cytological survey of all 11 taxa of sect. *Quelus*, examining 103 individuals from natural populations and 11 cultivated plants. Their results showed the section to be entirely polyploid, predominantly tetraploid ($n = 2x = 22$), but with octoploidy ($n = 4x = 44$) found in two species. All other sections in the genus, except for the tetraploid, monotypic sect. *Kierschlegeria*, are entirely or mostly diploid ($n = x = 11$).

Tetraploidy was found in all specimens examined of six Brazilian species and in the more than 40 populations that were studied from the widespread *F. magellanica* of the southern Andes (see Hoshino & Berry, 1989, Table 1). Normal bivalent formation was observed in all of these collections.

Octoploidy was limited to the three subspecies of *F. regia* and a single cultivated individual of *F. alpestris*. *Fuchsia regia* subsp. *reitzii* and *F. regia* subsp. *serrae* were consistently octoploid, but tetraploid individuals were also found in *F. alpestris* and *F. regia* subsp. *regia*. In all octoploids examined, varying numbers of quadrivalents were present at meiotic Metaphase I and Anaphase I. Although tetraploid and octoploid plants occurred sympatrically in several localities, no hexaploid individuals were detected. The chromosome numbers of the individuals examined by Hoshino & Berry are indicated in this paper under the specimen citations of the respective taxa.

Palynology. Pollen grains of *Fuchsia* have distinctive, onagraceous features such as viscin threads, paracrystalline-spongy ectexine, protruding apertures, and a solid endexine. The genus is unique, however, in possessing predominantly two-aperturate, bilaterally symmetrical pollen grains. Radially symmetrical, three-aperturate grains also occur in the genus but are confined to polyploid species and are clearly derived from two-aperturate ancestors, a result of the increased cell volume of polyploid cells. Most sections of the genus can be distinguished by a combination of aperture number, viscin thread ultrastructure, and type of exine sculpture elements. Detailed pollen descriptions of the different sections are provided in Pragłowski et al. (1983) and Nowicke et al. (1984).

The members of sect. *Quelusia* have radially symmetrical and three-aperturate pollen grains, a condition consistent with the polyploidy found in all species of the section. Viscin threads are segmented-beaded, and the exine has globular sculpture elements. Praglowski et al. (1983) reported a size range of 33–60 μm for P (polar axis length) and 59–85 μm for E (equatorial axis) for the seven taxa they examined. Rare four-aperturate grains have been found in *F. coccinea* and *F. regia*; occasional two-aperturate grains were also found in *F. magellanica* and were considered to be reversions to the ancestral condition of the genus (Praglowski et al., 1983; Nowicke et al., 1984). Octoploid individuals of *F. regia* cannot be distinguished from tetraploids by differences in pollen morphology, although octoploid pollen grains may be significantly larger (Hoshino, pers. comm.).

The only other section of *Fuchsia* characterized by three-aperturate pollen is the monotypic sect. *Kierschlegeria* (*F. lycioides*). Its pollen can be distinguished from that of sect. *Quelusia*, however, by the smooth viscin threads with elongated sculpture elements (Nowicke et al., 1984).

FLAVONOID COMPOUNDS

Because of the ornamental appeal of *Fuchsia*, several studies have examined the role of anthocyanins in the different flower colors in the genus (Harborne, 1963; Yazaki & Hayashi, 1967; Nozzolillo, 1970; Yazaki, 1976; Crowden et al., 1977). Flower colors are determined almost entirely by the 3-glucosides and 3,5-diglucosides of all six common anthocyanins. Red coloration in the sepals and floral tube is due mostly to cyanidin and peonidin pigments, whereas the characteristic blue-violet color of the petals of all members of sect. *Quelusia* is due to the dominance of malvidin derivatives, with peonidin in much lesser concentrations (Nozzolillo, 1970; Yazaki, 1976; Crowden et al., 1977). Yazaki (1976) indicated that the intense blue-violet color of some cultivars is due to the simultaneous presence of other co-pigments in the cell, particularly quercetin glycosides. In some cultivars, the petals change color from blue-violet to purple-red with age; Yazaki (1976) has shown this to be due to the combined effect of the flavonoid co-pigments, together with a decrease in the pH of the cell sap brought about by the accumulation of organic acids.

Averett et al. (1986) carried out a comprehensive survey of the foliar flavonoids in 80 taxa of *Fuchsia* and reported the flavonoid profiles of four taxa belonging to sect. *Quelusia*. Current taxonomic changes in the section, however, have mod-

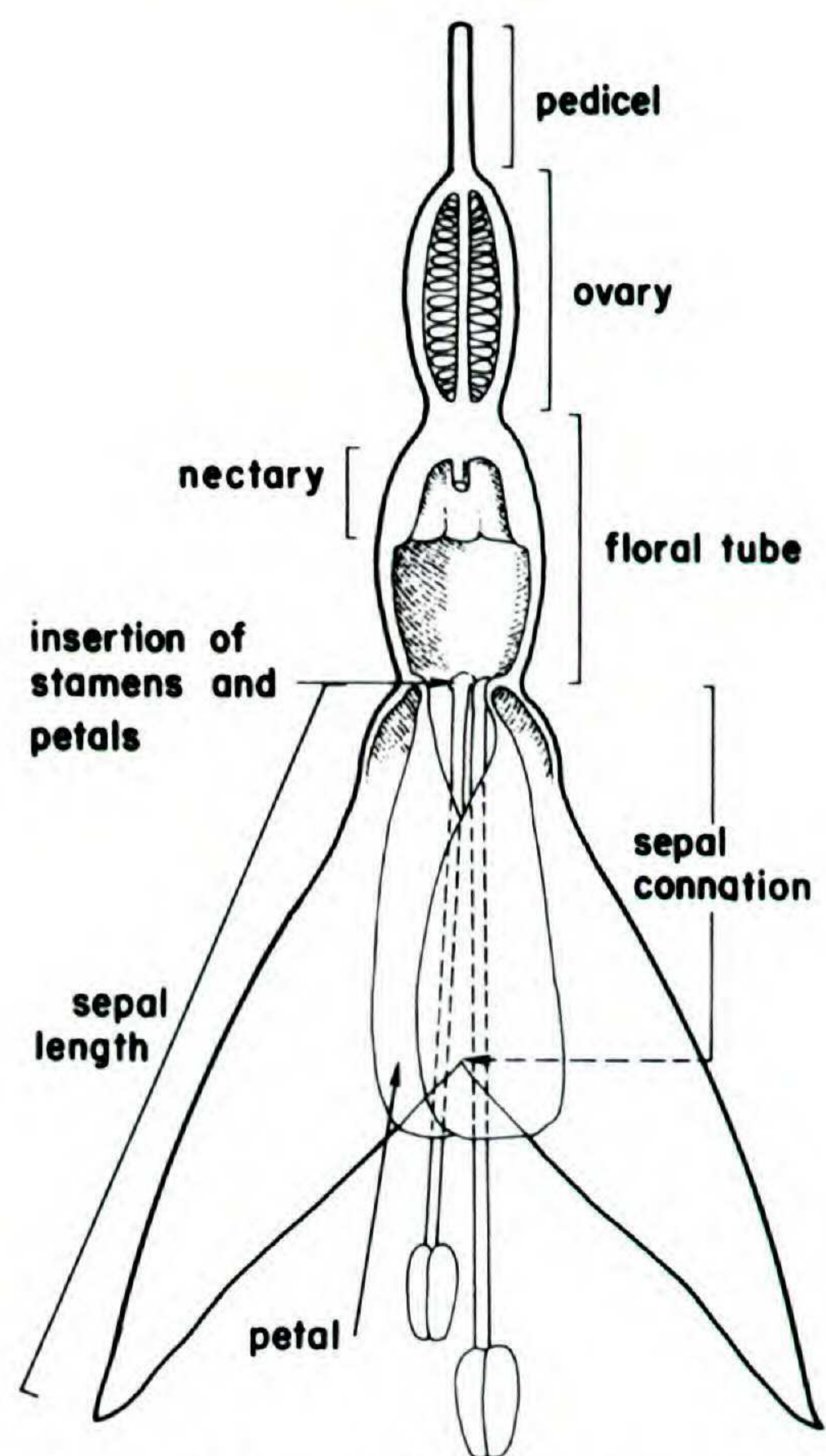


FIGURE 2. Schematic longitudinal section of a flower from *Fuchsia* sect. *Quelusia*, with terminology used in the species descriptions.

ified these results, and a revision is presented in Table 1. Based on the same samples examined by Averett et al. (1986), two additional taxa are now included, *F. brevilobis* and *F. regia* subsp. *serrae*. From these changes, it is apparent that it is *F. brevilobis*, not *F. regia*, that has a distinctive flavonol diglucoside. *Fuchsia magellanica* remains the only species in the section known to possess flavones (compounds 12 and 15), which could be used as excellent markers for detection of the percentage of this species in cultivars of uncertain origin, although flavones might not be expressed in all *F. magellanica* hybrids. Otherwise, the remaining flavonol monoglucosides are all of common occurrence in other taxa of the genus.

NATURAL HYBRIDIZATION

Because of the restricted distributions of most of the Brazilian species of *Fuchsia*, there is no range overlap among them, except with the widespread *F. regia*. *Fuchsia regia* occurs sympatrically with five other species, and in each case, morphologically intermediate, putatively hybrid individuals have been detected (Table 2). Populations of *F. regia* subsp. *serrae* also occur together with each of the other subspecies of *F. regia*, forming extensive hybrid swarms in areas of sympatry.

TABLE 1. Foliar flavonoids in species of *Fuchsia* sect. *Quelusia*.¹

Taxa Examined	Compounds ²									
	1	2	3	5	6	7	8	9	12	15
<i>F. brevilobis</i>	+		±	+	+			±		
<i>F. campos-portoi</i>	+		+		+	+	+	+		
<i>F. coccinea</i>	+				+	+	+	+		
<i>F. magellanica</i>	+	+	+		+	+	±		+	+
<i>F. regia</i> subsp. <i>regia</i>	+	±	+		+	±	+	+		
<i>F. regia</i> subsp. <i>serrae</i>	+	±	+		+	±	+	+		

¹ Based on the same samples as reported in Averett et al. (1986); changes in identifications are as follows: *Davidse et al. 10904, Hatschbach & Ramamoorthy 42974* (*F. brevilobis*), *Conrad & Dietrich 2055, Hatschbach & Ramamoorthy 42976, Ramamoorthy & Reitz 1163*, and *Ramamoorthy & Vital 685* (*F. regia* subsp. *serrae*); *Ramamoorthy & Vital 673, 674, 676, 680* (*F. regia* subsp. *regia*).

² + = present in all collections sampled, ± = present in some collections but absent in others. Same numerical codes as in Averett et al. (1986): 1 = K-3-O-glu; 2 = K-3-O-gal; 3 = K-3-O-rham; 5 = K-3-O-rham-glu; 6 = Q-3-O-glu; 7 = Q-3-O-gal; 8 = Q-3-O-rham; 9 = Q-3-O-ara; 12 = A-7-O-glu; 15 = L-7-O-glu. Abbreviations: K = kaempferol, Q = quercetin, A = apigenin, L = luteolin, glu = glucose, gal = galactose, rham = rhamnose, ara = arabinose.

The morphological intermediacy of several characters was the main criterion used in detecting hybrids between different taxa; in most cases, both putative parents were growing sympatrically close by. Details of the different hybrid combinations found are provided in the Appendix.

Natural hybridization among sympatric taxa of sect. *Quelusia* appears to occur readily, as there are no major differences in pollinators, flowering time, or habitat in mixed populations. The only indication that reduced fertility might occur in hybrids was from one artificial cross between a tetraploid individual of *F. regia* subsp. *regia* and an octoploid individual of *F. regia* subsp. *serrae*, where the hexaploid progeny showed low pollen fertility (Hoshino & Berry, 1989). More experimental work is needed on the chromosomal behavior of crosses between tetraploid and octoploid taxa in sect. *Quelusia*.

In most cases, the area where two species overlap is small, and the frequency or abundance of hybrids is low compared with the parental populations. *Fuchsia campos-portoi*, *F. coccinea*, and *F. glazioviana* are all high-altitude species that

grow in the open "campos de altitude" at or above treeline. Hybrids between these species and *F. regia* occur where they descend into the upper forest zone, or when *F. regia* extends beyond its normal limit into the open campos. *Fuchsia brevilobis* has the inverse of this pattern, generally occurring at lower altitudes than *F. regia* subsp. *serrae*, with probable hybrids in limited areas where their ranges overlap. *Fuchsia bracedinae* may have grown sympatrically with *F. regia* until the past century, when extensive cutting and burning eliminated the upper forest belt of most of the Serra do Caparaó.

The situation among the subspecies of *F. regia* is notably different. These taxa are much more widespread and overlap more extensively than any of the other species in the section. *Fuchsia regia* subsp. *reitzii* is typical of the planalto region in Rio Grande do Sul and southern Santa Catarina states, but it contacts populations of the more mesic *F. regia* subsp. *serrae* along the easternmost edge of the planalto near the crests of the Serra Geral, producing large, widely variable, intermediate populations. Extensive intergradation between *F. regia* subsp. *regia* and *F. regia* subsp. *serrae* occurs

TABLE 2. Sympatric occurrence and natural hybridization among the native taxa of *Fuchsia* sect. *Quelusia* in Brazil. An X indicates that both sympatry and natural hybridization occur. Abbreviations are of the first three letters of the specific (capitals) or subspecific (lower case) epithets.

Subspecies of <i>F. regia</i>										
subsp. <i>regia</i>	X	—	—	X	X	X	—			
subsp. <i>reitzii</i>	—	—	—	—	—	—	—	—		
subsp. <i>serrae</i>	—	—	X	—	—	—	—	X	X	
	ALP	BRA	BRE	CAM	COC	GLA	HAT	reg	rei	

along the eastern edge of the Serra da Bocaina and the Serra do Mar in northern São Paulo state.

Although *F. regia* is the only species presently found in widespread contact with other species of sect. *Quelusia*, the numerous hybrid combinations detected indicate that interspecific genetic recombination may have been an important mechanism in providing a rich source of novel, adaptive genotypes in the fuchsias of southern Brazil.

EVOLUTION OF SECTION *QUELUSIA*

Various lines of evidence, including chloroplast DNA restriction fragment analysis (Sytsma & Smith, 1988) and leaf flavonoid analyses (Averett et al., 1986), have suggested the Old World sect. *Skinnera* to be the earliest offshoot of the genus and the sister group of all the American sections of *Fuchsia*. The oldest fossil pollen grains of the genus have been found in New Zealand and Australia from Oligocene and Miocene deposits (Pocknall & Mildenhall, 1984; Berry et al., in prep.). Despite the early divergence of this group, the members of sect. *Skinnera* exhibit several specialized features for the genus, including the derived condition of male sterility, reduced petals, presence of flavone sulphates, and a variety of unusual life forms, such as large trees and procumbent creepers.

The most likely area of origin of *Fuchsia* is South America, where the greatest concentration of species as well as the sections with the most generalized features in the genus occur (Raven, 1979a; Berry, 1982). Whereas the large Andean sections appear to have arisen and radiated during the Neogene uplift of the tropical Andes (Berry, 1982, 1985), the areas now occupied by sect. *Quelusia* have changed little since the mid-Tertiary, when temperate forests were much more widespread in southern South America (Simpson, 1973). With the current Australasian fossil record, it is now apparent that *Fuchsia* formed part of the *Nothofagus* and podocarp-dominated temperate forests that occurred more or less continuously across southern South America, Antarctica, and Australia until at least the late Eocene (Zinmeister, 1987; Truswell, in press). The wet, temperate forests of the southern Andes and the montane forests of southeastern Brazil are now the only remnants of these austral temperate forests in South America, which, like *Fuchsia*, share a large number of disjunct plant groups that also have close relatives in Australasia (Raven, 1979b).

Although there are no fossil records to indicate an early presence of sect. *Quelusia* in South Amer-

ica, the section follows a pattern consistent with other relicts of the southern temperate forests. It is ecologically conservative, with most individuals restricted to moist sites in cool, forest habitats. Morphologically, there is little divergence in the section, with species differentiated by relatively minor variations on a common pattern of floral and vegetative characters. Many of the features of sect. *Quelusia* are unspecialized in the genus, including the axillary, bisexual flowers, well-developed petals, numerous seeds, and segmented-beaded viscin threads. It is possible that some of the primitive characters in sect. *Quelusia* were preserved through the buffering effects on evolutionary divergence caused by paleopolyploidy in the group (Stebbins, 1985; Hoshino & Berry, 1989).

The ancestor of the modern-day species of sect. *Quelusia* was probably tetraploid, with derived, three-porate pollen (Hoshino & Berry, 1989). As such, it could not have given rise directly to the other, mostly diploid, sections of the genus, but rather represents an early offshoot of the ancestral stock of *Fuchsia* in South America. Early on, sect. *Quelusia* developed its own floral syndrome for hummingbird pollination: the relatively short, nectar-holding floral tube; large, attractive sepals; and petal cone and sepal tube that further extend the tubular portion of the blossom.

Section *Kierschlegeria*, containing only *F. lycioides* restricted to the dry coastal scrub of central Chile, is the only other section of *Fuchsia* that is entirely polyploid and has three-porate pollen grains. Because of this similarity and its geographic proximity to *F. magellanica*, Berry (1982) and Raven (1988) postulated that it is related to sect. *Quelusia*. Using chloroplast DNA restriction fragment analysis, Sytsma & Smith (1988) demonstrated that sects. *Quelusia* and *Kierschlegeria* form a distinct lineage from the rest of the genus, defined by three synapomorphies. Furthermore, within this lineage *F. lycioides* could not be distinguished from the two species of sect. *Quelusia* studied, *F. magellanica* and *F. regia*. This evidence of a close relationship is remarkable, since *F. lycioides* has a high number of specialized features, such as functional dioecy, spinose leaf bases, low seed number, smooth viscin threads, small flowers, and summer deciduousness. Evidently, the evolutionary shift of sect. *Kierschlegeria* to a xeric habitat in the southern Andes entailed a large number of morphological changes corresponding to a much smaller degree of genotypic divergence.

Within sect. *Quelusia*, we are faced with the question of why there is just one species in Chile and Argentina, while in Brazil there are eight species

in an area of comparable size. *Fuchsia magellanica* is a classic example of the lack of differentiation that is characteristic of the *Nothofagus* forests of Chile. These habitats presumably have been stable and continuous for long periods of time, providing little opportunity for speciation to occur. Most taxa inhabiting these areas have retained primitive characters for their respective groups (Simpson, 1973). Although the current distribution of *F. magellanica* extends beyond the *Nothofagus* forests, virtually all of the area now occupied by this species south of 44°S latitude was covered by ice during the Pleistocene (Vuilleumier, 1971).

In contrast to the temperate latitudes of Chile and Argentina, the Brazilian members of sect. *Quelusia* are centered in the subtropics. There, *Fuchsia* is limited to the cool, moist habitats of the coastal mountains and the interior planaltos. Most of the cold-adapted taxa of Brazilian fuchsias are vicariant species that are now restricted to just a few high mountain peaks. Allopatric speciation in this group of species was likely enhanced by the joining and subsequent separation of populations caused by the cycles of Pleistocene glacial and interglacial events (Simpson, 1979; Klein, 1984).

Two of the Brazilian species have adapted to warmer, lower-altitude habitats that are more continuous over much of the southeastern part of the country. *Fuchsia regia* extends over the entire range of the section in Brazil and forms a broad taxonomic complex treated here as comprising three subspecies, each adapted to a slightly different set of environmental conditions. This species shows an intermediate stage in the morphological differentiation of populations between the more uniform *F. magellanica* in the southern Andes and the distinct, high-altitude species of Brazil. *Fuchsia regia* overlaps geographically with most of the other species in the section and hybridizes with them whenever they come into contact; these hybrids may constitute an important source of genetic recombination for new adaptive genotypes in the section. It is also the only species in the genus with naturally occurring octoploid populations, which may lead to partial reproductive isolation with the other tetraploid taxa in the section.

Two newly described species from Paraná, Brazil both consist of tetraploid populations that occur within the range of the octoploid subspecies of *F. regia*. The different ploidy levels may afford sufficient reproductive isolation for these species to remain distinct. One of the new species, *Fuchsia hatschbachii*, is the only species in the section that appears to be edaphically specialized, occurring on limestone and sandstone substrates on the eastern

edge of the southern planalto. Populations of *F. regia* subsp. *serrae* occur within 15 km of *F. hatschbachii* near Curitiba, Paraná, but the two have never been observed to grow together under natural conditions. The other new species, *Fuchsia brevilobis*, is specialized in its small flowers with elongate sepal tubes, and it has become adapted to lower altitudes than most neighboring populations of *F. regia*.

Overall, the evolutionary scenario of sect. *Quelusia* differs significantly from the two, more speciose, Andean sects. *Fuchsia* and *Hemsleyella*. Those species radiated recently into a broad expanse of new, cool montane habitats that were created with the recent uplift of the tropical Andes (Berry, 1982, 1985). Section *Quelusia*, on the other hand, has occupied a more ancient and stable vegetation type in which disruptive selection may have played less of a role in the divergence of populations.

CLADISTIC ANALYSIS

This section examines the relationships of the taxa of sect. *Quelusia* and the closely related *F. lycioides* by means of a formal cladistic analysis. The advantages of this approach are that it provides clearly stated hypotheses about evolutionary relationships based on shared, derived character states, and it is based on an objective, repeatable methodology.

The data were analyzed on an ATT 6300 microcomputer by the Wagner parsimony method of the PAUP software package (version 2.4.1., Swoford, 1985), using the branch and bound algorithm (Hendy & Penny, 1982). Character polarity was determined by outgroup comparison (Hennig, 1966; Watrous & Wheeler, 1981), using sect. *Skinnera* as the outgroup. In two characters, however, the character states in sect. *Skinnera* are almost certainly apomorphic in the genus; so in these cases the other genera of Onagraceae were used as the outgroup.

Twenty-two characters were used in the phylogenetic analysis, with the character states listed in the data matrix (Table 3).

Fifteen equally parsimonious trees were produced, each with 29 steps and a consistency index of 0.931. Topologically all the trees are identical, as they represent arbitrary resolutions of a single tetrachotomy that appears in the trees. The unique topology of these trees is presented in Figure 3. According to these results, sects. *Kierschlegeria* and *Quelusia* form a monophyletic group defined by five synapomorphies, but within this clade *F.*

TABLE 3. Data matrix for characters of taxa used in the cladistic analysis of *Fuchsia* sects. *Quelusia* and *Kierschlegeria*. Sect. *Skinnera* is used as the outgroup. Characters 9, 16, and 17 are unordered. A zero represents the plesiomorphic states, and higher numbers represent the apomorphic states. In those characters where no zero appears, the plesiomorphic conditions are uncertain, and the character states were coded as unordered.

Taxon	Characters																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
sect. <i>Skinnera</i>	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	1	0	0	?	0	?
<i>F. lycioides</i>	1	1	1	0	0	0	0	0	2	1	0	1	1	0	1	2	2	0	0	0	0	?
<i>F. alpestris</i>	1	?	0	?	1	1	1	1	3	0	0	0	0	0	0	3	3	0	0	1	1	0
<i>F. bracedinae</i>	1	1	0	?	1	1	1	1	3	0	0	0	0	0	0	3	3	0	1	0	1	0
<i>F. brevilobis</i>	1	1	0	1	2	1	1	1	3	0	0	0	0	0	0	3	3	0	0	1	1	0
<i>F. campos-portoi</i>	1	1	0	1	1	1	1	1	3	0	0	0	0	0	0	3	3	0	0	0	0	1
<i>F. coccinea</i>	1	1	0	1	1	1	1	1	3	0	0	0	0	0	0	3	3	0	1	0	1	0
<i>F. glazioviana</i>	1	1	0	?	1	1	1	1	3	0	0	0	0	0	0	3	3	0	0	0	0	1
<i>F. hatschbachii</i>	1	1	0	1	1	1	1	1	3	0	0	0	0	0	0	3	3	0	0	0	0	0
<i>F. magellanica</i>	1	1	0	0	1	1	1	1	3	0	0	0	0	0	0	3	3	0	0	0	0	0
<i>F. regia</i> :																						
subsp. <i>regia</i>	1	?	0	1	1	1	1	1	3	0	0	0	0	0	0	3	3	0	0	1	0	0
subsp. <i>serrae</i>	1	2	0	1	2	1	1	1	3	0	0	0	0	0	0	3	3	1	0	1	0	0
subsp. <i>reitzii</i>	1	2	0	?	1	1	1	1	3	0	0	0	0	0	0	3	3	0	0	0	0	0

1. Pollen grains: 0 = 2-porate, 1 = 3-porate
2. Ploidy level: 0 = diploid, 1 = tetraploid, 2 = octoploid
3. Viscin threads: 0 = segmented-beaded, 1 = smooth
4. Flavones: 0 = present, 1 = absent
5. Sepals: 0 = unfused, 1 = fused < 1/4 of length, 2 = fused > 1/3 of length
6. Leaves: 0 = alternate, 1 = opposite/whorled
7. Stamens: 0 = included within sepals, 1 = exerted beyond sepals
8. Floral tube: sepal length: 0 = (sub)equal, 1 = sepals noticeably longer
9. Nectary: 1 = smooth band around lower part of floral tube, 2 = thick lobes at base of tube around style, 3 = protruding from lower part of floral tube
10. Stigma: 0 = subentire, 1 = 4-lobed (on functional female flowers)
11. Pollen color: 0 = cream, 1 = blue
12. Seed number per fruit: 0 = > 50, 1 = < 40
13. Petiole bases: 0 = deciduous, 1 = persistent and spinose
14. Sexual system: 0 = hermaphrodite, 1 = male sterility determined by dominant gene
15. Sexual system: 0 = hermaphrodite, 1 = male sterility present and determination unknown
16. Petal color: 1 = dark maroon, 2 = pink or pale purple, 3 = blue-violet
17. Petal imbrication: 1 = separate, 2 = slightly overlapping, 3 = strongly convolute
18. Stipules: 0 = small and deciduous, 1 = thick-crassate and persistent
19. Petioles: 0 = > 3 mm long, 1 = < 3 mm long
20. Habit (branch type): 0 = shrubby, 1 = lianoid
21. Pubescence: 0 = plant glabrous or sparsely pubescent, 1 = parts of plant densely pilose
22. Internodes: 0 = > 16 mm, 1 = < 16 mm

lycioides is the sister group to all of sect. *Quelusia*. Section *Quelusia* is well delimited by the presence of four synapomorphies, and *F. lycioides* possesses eight unique, derived character states (autapomorphies). Within sect. *Quelusia*, *F. magellanica* appears as the sister group of all the Brazilian taxa, which are grouped by a single character, loss of flavones. The Brazilian taxa of *Fuchsia* are poorly differentiated by the cladistic analysis, forming a polychotomy with four different lineages. *Fuchsia hatschbachii* is an isolated line in Brazil, differing from *F. magellanica* only by the loss of flavones. The three subspecies of *F. regia* form a separate, mainly octoploid lineage, supporting the monophy-

ly of *F. regia* sensu lato. *Fuchsia glazioviana* and *F. campos-portoi* are sister species within the third lineage. The fourth lineage includes four species, which are divided into two species pairs, the high-altitude *F. bracedinae* and *F. coccinea*, and *F. alpestris* and *F. brevilobis*. Two homoplasies (parallelisms) occur in the cladogram: long-connate sepals in *F. brevilobis* and *F. regia* subsp. *serrae*, and lianoid habit in two species pairs.

The paucity of characters that discriminate between the taxa of sect. *Quelusia* makes the results of the cladistic analysis within the section quite tentative, but it is also a reflection of the very close relationship of the species. The proposed sister-

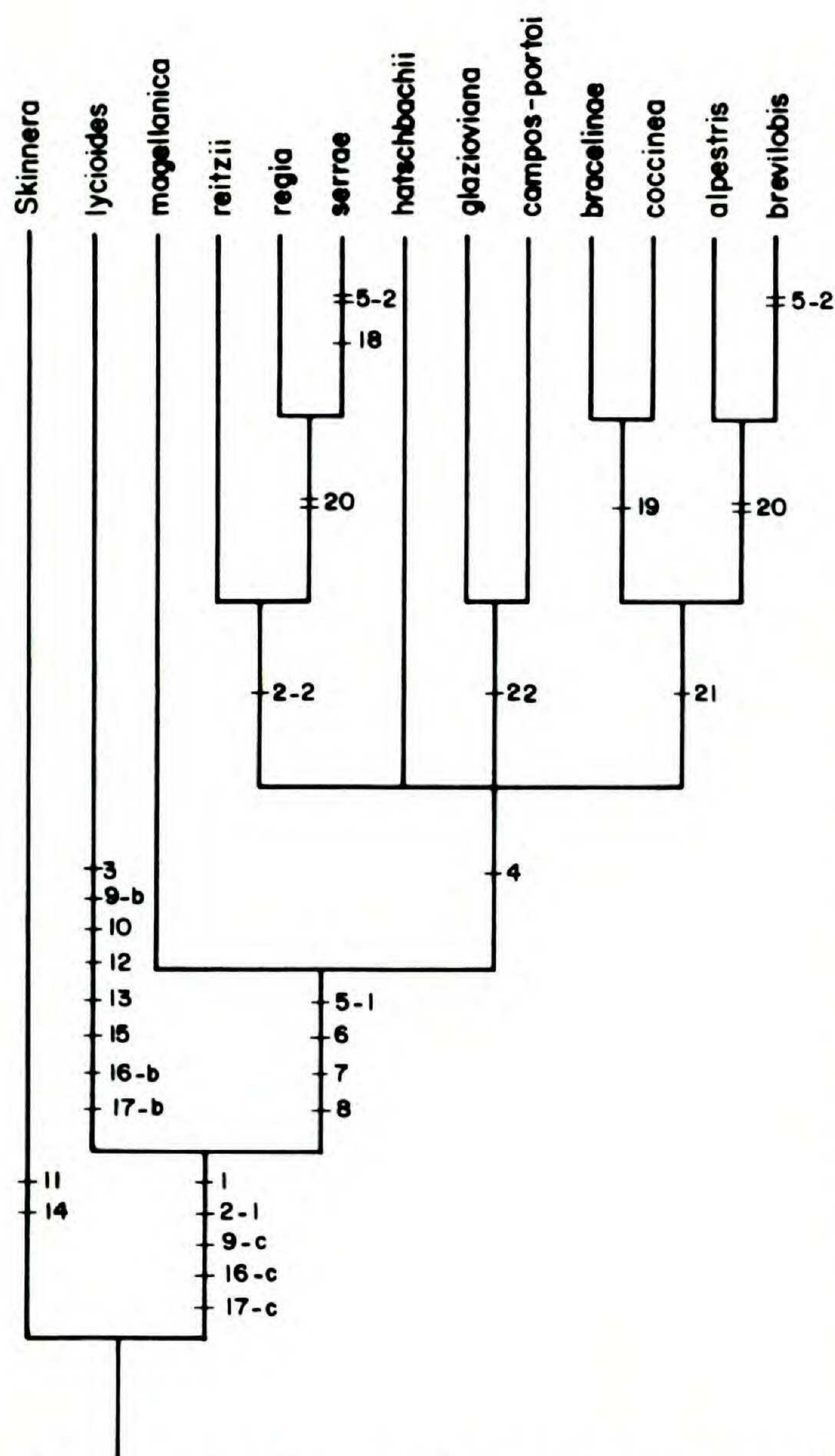


FIGURE 3. Cladogram of *Fuchsia* sects. *Quelus* and *Kierschlegeria* (*F. lycioides*). Sect. *Skinnera* is used as the outgroup. Double crossbars indicate homoplasies. See Table 3.

group relationship of *F. magellanica* to the Brazilian members of the section is consistent with the biogeography of the group and the evolutionary hypotheses discussed previously, specifically the southern origin of the genus in South America and the secondary radiation of the section in the highlands of southeastern Brazil. According to this hypothesis, the Brazilian taxa differentiated, after their separation from the Andean *F. magellanica*, from an ancestor that had lost flavones. The occurrence of two parallelisms between *F. brevilobis* and *F. regia* subsp. *serrae* is remarkable and may be the result of past hybridization between the two species.

HISTORY OF CULTIVATION

Members of sect. *Quelus* were by far the most important species used in the early stages of fuchsia breeding. For the most part, however, fuchsia breeders in the past century kept few records about

the parentage of their introductions. As a result, it is impossible to determine with certainty which species have been involved in the parentage of most of the modern cultivars (Reiter, 1944). Ancestry of sect. *Quelus* can be assumed in cultivars that share the following exclusive "quelusoid" traits: fairly large, axillary flowers with sepals equal to or longer than the floral tube, and large, violet, rounded, and strongly convolute petals.

Following Reiter (1944), one can distinguish three stages in the history of fuchsia breeding during the past century. First, a variety of species and natural varieties were accumulated in cultivation. Next, these were crossed to select desirable combinations and produce a few, selected strains. This second stage began mostly with crosses between different introductions from sect. *Quelus*, and then in a more important step, these were crossed with Mexican and Central American species of sect. *Ellobium*. Some of the resulting strains were further crossed with species of other sections, such as *F. boliviana* (sect. *Fuchsia*) and *F. lycioides* (sect. *Kierschlegeria*). Although some other crosses were made that did not involve species of sect. *Quelus*, these were far fewer and less popular than the quelusoid crosses. The final stage involved the exploitation and selection of mutations, which no longer depended upon the introduction of native material. In the remainder of this section, I will review the role of sect. *Quelus* in the first two stages of fuchsia breeding, then summarize the present-day situation of sect. *Quelus* species in cultivation.

Species introductions. With the possible exception of a short-lived introduction of *F. triphylla* in the early 18th century (Wright, 1975), *F. coccinea* was the first species of *Fuchsia* introduced into cultivation in Europe. Plants of this species were growing at Kew Gardens in London in 1788 (Aiton, 1789), and an illustration of it was published by Sims (1789). Hooker (1869) suggested that Sims's figure might have represented *F. magellanica* rather than *F. coccinea*, because of the prominent petioles on the lower leaves. This is clearly not the case, however, as the figure accurately represents the unique arching pedicels and ovate, sessile upper leaves of *F. coccinea*, and Sims's own specimen deposited at Kew is *F. coccinea* (pers. obs.). Although Dryander stated that the plants he described were introduced from Chile (Aiton, 1789), the species is native to just a few mountains in Minas Gerais, Brazil.

The next introduction from sect. *Quelus* was *F. magellanica*. An array of different variants of this species appeared in England in the 1820s

under several names, starting with *F. gracilis*, which was reported from the Edinburgh Botanic Garden in 1822 (Lindley, 1824). *Fuchsia conica* and *F. gracilis* var. *multiflora* were both introduced into England from Chile in 1824 (Lindley, 1827a, b). *Fuchsia discolor* was introduced from Port Famine in the Magellan Straits around 1830 (Lindley, 1835). I have seen no other evidence, such as old herbarium specimens from cultivated individuals, to indicate that *F. magellanica* was present in Europe prior to 1822. Soon after *F. magellanica* was introduced, however, it was confused with *F. coccinea* and was often cited as *F. coccinea* (see de Candolle, 1828, and Hooker, 1869).

Fuchsia regia was first grown in England between 1838 and 1840, under the name *F. radicans* (Lindley, 1841), and *Fuchsia alpestris* was cultivated in the Glasgow Botanic Garden as early as 1842 (Gardner, 1843).

Interspecific crosses. Interspecific hybridization among members of sect. *Quelusia* must have begun in the mid-1820s, but the first evidence for this was the appearance of *F. globosa* in a Horticultural Society exposition in London in 1832 (Lindley, 1833). Although the origin and parentage of this plant were not known to Lindley, the illustration and the description strongly suggest that it was a cross between *F. magellanica* and *F. coccinea*. A great proliferation of names of cultivars that were either variants of *F. magellanica* or crosses with *F. coccinea* followed in the next decades, including *F. riccartonii*, *F. tenella*, *F. recurvata*, and *F. corallina*. The history of these plants is unfortunately too poorly documented to determine their precise parentage, and names such as *riccartonii* have been applied to quite different cultivated strains (J. Wright, pers. comm.).

A major step in the search for novel, interesting traits in *Fuchsia* cultivars was the use of *F. fulgens*, a diploid species of the Central American section *Ellobium*, in crosses with selections from sect. *Quelusia*. One of the first such hybrids produced was exhibited in London in 1839, a cross of *F. fulgens* with *F. globosa* called "Standish's Fuchsia" (Lindley, 1840), which must have been either triploid or a spontaneously doubled hexaploid. Harrison (1841) also made a large number of crosses of *F. fulgens* with sect. *Quelusia* hybrids, publishing figures of the flowers of several of the different hybrids he selected. A hybrid between *F. cordifolia* (= *F. splendens*, sect. *Ellobium*) and *F. globosa* was grown in 1842, under the name *F. exoniensis* (Paxton, 1843). *Fuchsia regia* was also used in a

series of crosses starting in 1840, leading to the development of darker petal color and improvement of flower shape (Wright, 1979). *Fuchsia boliviana*, a member of sect. *Fuchsia* from South America, may also have been used in the early crosses with selections of sect. *Quelusia* (J. Wright, pers. comm.).

The 19th-century crosses between members of sect. *Quelusia* and sect. *Ellobium* can be considered the "mainstream" fuchsias later treated collectively under the names *F. hybrida* Hort. (Siebert & Voss, 1896; Munz, 1943) and *F. speciosa* Hort. (Bailey, 1900). In the strictest sense, these names have been attributed to crosses between *F. magellanica* and *F. fulgens*. At the other extreme, they have been used to include almost all garden fuchsias. Reiter (1944) suggested that *F. hybrida* might best be treated as a horticultural complex including all cultivars of sects. *Quelusia* × *Ellobium* ancestry, including many of complicated origin.

Chaudhuri (1956) made cytological observations that suggest how crosses between *F. magellanica* and *F. fulgens* might have facilitated the rapid advances in fuchsia breeding during the mid-1800s. In his crossing experiments, the tetraploid ($n = 2x = 22$) *F. magellanica* and the diploid ($n = x = 11$) *F. fulgens* yielded triploid progeny in which a high percentage of unreduced gametes were produced. As a result, the F_1 crosses were partially fertile, and hexaploids ($6x$) were produced in the F_2 generation, as well as tetraploid ($4x$) and pentaploid ($5x$) individuals in the respective backcrosses. All of these crosses retained some degree of fertility. Crosses between *F. magellanica* and other diploids, such as *F. splendens* and *F. denticulata*, did not have the same propensity for unreduced gametes as *F. fulgens*, and their hybrids were largely sterile. Thus, *F. fulgens* may have been a critical species that helped prevent total sterility in crosses with the polyploid members of sect. *Quelusia* and with later cultivars of even higher ploidy levels.

More recently, J. O. Wright in England has confirmed Chaudhuri's findings, producing a complete set of $3x$ to $9x$ progeny, entirely by selfing and backcrossing the original *F. magellanica* × *F. fulgens* hybrids (J. Wright, pers. comm.). Wright further reports that none of these hybrids showed any obvious similarity to *F. fulgens*.

Fuchsia magellanica is the only species in sect. *Quelusia* able to withstand winter conditions with long periods of freezing temperatures, so that all of the hedge plants of fuchsia grown outdoors in England and Ireland are variants of this species or crosses with a strong *F. magellanica* parentage.

Many of the recent introductions from Brazil, however, such as *F. campos-portoi* and *F. coccinea*, are proving to be frost-resistant as well (J. Wright, pers. comm.).

Native species in cultivation today. Many of the early species introductions have been maintained for long periods of time in cultivation without crossing. Thus, Hooker (1869) was able to trace plants of *F. coccinea* found in the Oxford Botanic Garden in 1867 back to the original introduction of that species at Kew in 1788. Although this species may have been later lost from cultivation in England and Europe, it was successfully established on several of the Atlantic islands off the north African coast, such as Madeira, St. Helena, and the Canary Islands, in the early 1800s, persisting to present day (Hansen, 1969; A. Calero, pers. comm.). Plants of *F. alpestris* grown today in England and continental Europe have particularly small leaves similar to Gardner's type specimen and may well date back to his original introduction in 1842. Wild strains of *F. magellanica* are apparently still present in England, and the species has become widely naturalized in parts of Ireland, New Zealand, Hawaii, South America, and eastern and southern Africa.

As a result of the author's collections of native fuchsias in Brazil between 1985 and 1987, and seeds of different strains of *F. magellanica* obtained from Chile and Argentina, many new species and strains from sect. *Quelusia* have been recently introduced into cultivation. All the taxa recognized in this treatment, except *F. braselinae* and *F. glazioviana*, are now in cultivation, with the most complete collections grown at the University of California Botanical Gardens at Berkeley and in the private garden of Mrs. Drude Reiman-Dietiker in the Netherlands. Other important collections include those of Mr. J. O. Wright in England, members of the different amateur fuchsia societies on the west coast of the U.S., and the Nederlandse Kring van Fuchsia-Vrienden in the Netherlands.

SYSTEMATIC TREATMENT

Taxonomic history. The earliest known specimens of *Fuchsia* from South America were collected in the Magellan Straits around 1690 by George Handisyd, who was surgeon aboard the British ship *Modena* (Middleton, 1909). These collections correspond to *F. magellanica* and are deposited in the eighth volume of Hans Sloane's herbarium at BM. Louis Feuillée published the first description and illustration of this species under the name *Thilco* (Feuillée, 1725), but it was not

taken up by Linnaeus, who described *Fuchsia* in 1753 in *Species Plantarum*. More specimens of *Fuchsia* were collected in the Magellan Straits in January of 1768 by Philibert Commerson, naturalist on the French survey expedition led by Louis de Bougainville. Commerson's specimens were examined by Lamarck, who designated them the type collection for *F. magellanica*, which he described in 1788. Another early collection of this species was made by Ruiz and Pavón between 1778 and 1788, near Concepción, Chile; they later described it as *F. macrostema* (Ruiz & Pavón, 1802).

Domingo Vandelli published the genus *Quelusia* in 1788, based on Brazilian plants. He did not name a species, and his description and illustration dealt mostly with the flower, making it difficult to distinguish which of the Brazilian species he was treating. José M. da C. Vellozo, a contemporary of Vandelli, described *Quelusia regia* from Brazil, providing locality information and an illustration that included leaves and flowers. Due to political problems, however, Vellozo's name for the species was not published until 1829 (Borgmeier, 1937; Carauta, 1973).

Jonas Dryander described *Fuchsia coccinea* in 1789 based on cultivated plants that had been introduced in England the previous year. The source of his plants remains unclear, however, since Aiton (1789) attributed their introduction from Chile by a Captain Firth, while Salisbury (1791) stated that they were brought from Brazil by Vandelli around 1787. In reprinting Vandelli's publication of *Quelusia*, Roemer (1796) added a footnote wherein he stated that Vandelli's genus was the same as Dryander's *F. coccinea*. Meanwhile, Salisbury (1791) had already synonymized *Quelusia* under *F. coccinea*.

In the first conspectus of the genus, de Candolle (1828) designated *Quelusia* as a section of *Fuchsia*; by that time, the identity of *F. magellanica* and *F. coccinea* were already badly confused, and de Candolle considered them to be synonymous.

Collections made in Brazil by Auguste de Saint-Hilaire between 1816 and 1822 resulted in the description of four new species by Jacques Cambessèdes in 1830. None of these species have been maintained in the present treatment, but the name *F. integrifolia* Camb. was long used for *F. regia*.

During the 1820s and 1830s, there was a sudden surge of collections of *Fuchsia* from Brazil and Chile, and many plants were shipped for cultivation in Europe. Several new taxa, most of them now included under *F. regia* and *F. magellanica*, were described by John Lindley, George Gardner, and Karel Presl. During the second half of the 19th

century, Auguste Glaziou made extensive collections in eastern Brazil, when this area was off limits to most foreign botanists. The rare *F. glazioviana* was described from one of his finds.

During the first half of this century, Curt Brade and Ynes Mexia collected fuchsias from the two highest peaks of southern Brazil, Pico da Bandeira and Itatiaia. Their collections led to the description of two local endemics, *F. bracelinae* and *F. campos-portoi*.

The leading figure in *Fuchsia* taxonomy was Philip Munz, who published a comprehensive revision of the genus in 1943. He refined the sectional concepts and limited sect. *Quelusia* to a closely knit group of species from Brazil and one from the southern, temperate Andes. He recognized five species in the section, as well as *F. hybrida*, which covered most of the cultivated hybrids. Two of his species were polytypic: *F. magellanica* had three varieties, and *F. regia* four.

Since Munz, many new collections have accumulated, especially from the southern states of Brazil, where Balduino Rambo, Raulino Reitz, Roberto Klein, and Gert Hatschbach have made significant contributions. Their collections have led me to recognize four new taxa of *Fuchsia* from the south of Brazil in this treatment. During two field trips in 1985 and 1987, I was able to collect and study field populations of all the Brazilian taxa.

Criteria for taxonomic rank. In distinguishing species within the section, I attempted to recognize basic, morphologically definable units that are also correlated with geographical, ecological, or cytological discontinuities between populations. It is assumed that these units also reflect the evolutionary divergences that have taken place in the group, but such hypotheses must be subjected to much more rigorous testing methods before they can be substantiated.

Subspecific rank was used when a wide-ranging species exhibited geographically or ecologically distinct morphological variants, but these were linked by intermediate populations along localized areas of sympatry.

Although different varieties have been recognized in the past for some species of *Fuchsia*, there is little biological basis for recognizing varieties. Similar pale color variants, for example, have appeared independently in a series of geographically distinct populations of *F. magellanica*, and they are probably the result of a single, recessive gene mutation (Chaudhuri, 1956). I do not consider this kind of variation worthy of formal taxonomic recognition in a biosystematic revision such as this,

although I do recognize the utility of assigning names to such plants for horticultural purposes.

In widespread species, such as *F. regia* and *F. magellanica*, it has not been feasible to distinguish the genetic basis for the many minor variants that exist from environmentally induced variations or inherent plasticity in the plants. Most likely, genetically determined variations will best be recognized through careful observation of plants cultivated under uniform growing conditions. In this way, amateur and professional nurserymen can make valuable contributions to our taxonomic understanding of sect. *Quelusia* in the future, especially if they maintain well-documented records of the provenance of their stock and the constancy and inheritance patterns of the different characters.

In view of the uncertain phylogeny of the species of sect. *Quelusia*, they are listed as follows in alphabetical order.

***Fuchsia* section *Quelusia* (Vandelli) de Candolle, Prodr. 3: 36. 1828. *Quelusia* Vandelli, Fl. Lusit. Brasil., 23, fig. 10, 1788; Roemer, Script. Pl. Hisp. Lusit. Brasil., 101, tab. 7, fig. 10. 1796. LECTOTYPE: *Fuchsia coccinea* Dryander. *Quelusia* was published without the protologue naming a species, but Vandelli's original text and engraving were reproduced by Roemer, who stated in a footnote that the description corresponded to *F. coccinea*. Salisbury (1791) and de Candolle (1828) treated *F. coccinea* as the type of *Quelusia*. Therefore, Munz's (1943) choice of *F. magellanica* as the lectotype of *Quelusia* and Berry's (1982) designation of *F. regia* as the lectotype cannot be upheld.**

Erect, scandent or climbing shrubs, subshrubs, or lianas. Leaves opposite or whorled. Flowers hermaphroditic, pendulous and axillary near the branch tips. Sepals normally reddish, longer than the floral tube and connate at the base. Petals purple, strongly convolute, erect, shorter than the sepals. Stamens erect, exerted beyond the sepals, the anti-sepalous filaments longer than the antipetalous ones. Pollen grains triporate or occasionally 4-porate, with segmented-beaded viscin threads. Nectary adnate to the base of the floral tube, smooth or ridged. Stigma clavate to subglobose, obscurely 4-cleft at the apex. Berries with ca. 60–120 seeds. Gametic chromosome number $n = 22, 44$.

Distribution (Fig. 1). Southeastern Brazil, from Minas Gerais to Rio Grande do Sul, and the Andes

of southern Chile and Argentina from 33°S to 55°S latitude.

Etymology. The name *Quelusia* was given by Vandelli after Queluz, the summer palace of Por-

tuguese royalty located outside of Lisbon (Don, 1832).

Common names. Chile: chilco, chilca, palo blanco, fucsia, tilco. Brazil: brinco de princesa.

KEY TO THE SPECIES OF *FUCHSIA* SECTION *QUELUSIA*

Note: Leaf measurements are based on mature, fully expanded leaves. Dimensions are intended to cover the full range of dry and fresh specimens.

- 1a. Petioles mostly 1–3 mm long, pilose.
 - 2a. Leaves elliptic, with acute to rounded base, pilose on all veins below; pedicels hanging, 12–20 mm long 2. *F. brachelinae*
 - 2b. Leaves ovate, with subcordate base, pilose mostly on lower 1/3 of midvein below; pedicels divergent from stems and pendent only in distal 1/3, 18–50 mm long 5. *F. coccinea*
- 1b. Petioles mostly more than 3 mm long, glabrous to pilose.
 - 3a. Sepals connate at the base (from the point of petal insertion) for ≥ 8 mm and $\geq 1/3$ of their total length.
 - 4a. Petioles mostly 4–8 mm long, leaves 10–25 mm wide, upper surface lightly sulcate-nerved; stipules inconspicuous 3. *F. brevilobis*
 - 4b. Petioles mostly 10–25 mm long, leaves 25–45 mm wide, upper surface smooth; stipules crassate and persistent 9. *F. regia* subsp. *serrae*
 - 3b. Sepals connate at the base for 2–7 mm and $\leq 1/4$ of their total length.
 - 5a. Leaves 2–6 mm wide, narrowly lanceolate; floral tube subrhombic, 4–6 mm long 4. *F. campos-portoi*
 - 5b. Leaves ≥ 8 mm wide, less than 5 times as long as wide; floral tube cylindrical-fusiform, 5–35 mm long.
 - 6a. Leaves 15–30 mm long, 8–15 mm wide, densely grouped on branches with internodes 3–12 mm long; floral tube 5–7 mm long and glabrous 6. *F. glazioviana*
 - 6b. Leaves longer or wider than above, internodes > 12 mm long; or floral tubes pubescent or > 7 mm long.
 - 7a. Petioles ≤ 6 mm long, leaf blade > 8 times as long as the petiole, leaves mostly opposite.
 - 8a. Plants glabrous, leaves 8–15(–30) mm wide; floral tube 10–15 mm long 7. *F. hatschbachii*
 - 8b. Plants densely pilose, leaves 20–70 mm wide; floral tube 5–9 mm long 1. *F. alpestris*
 - 7b. Petioles (3–)5–35 mm long, leaf blade < 6 times as long as the petioles, some or all leaves ternate or whorled.
 - 9a. Mostly erect shrubs; leaves membranous, usually glabrous, 15–60 mm long; margin serrulate and often shallowly lobed between teeth; petioles 0.3–1 mm thick; floral tube mostly 2–3.5 mm wide; berry narrowly oblong, 4–7 mm thick when ripe; southern Chile and Argentina 8. *F. magellanica*
 - 9b. Mostly scandent shrubs or lianas; leaves membranous to coriaceous, glabrous to pilose, 20–140 mm long; margin entire to gland-serrate; petioles 1–3 mm thick; floral tube 3–7 mm wide; berry oblong, ellipsoid, or globose, 9–13 mm thick when ripe; Brazil 9. *F. regia*

1. *Fuchsia alpestris* Gardner, Bot. Mag. 69: tab. 3999. 1843. TYPE: Brazil. Rio de Janeiro: Organ Mountains, "in moist, bushy, rocky places," 1,570 m, Mar. 1841, *George Gardner* 5706 (holotype, OXF; isotypes, BM, CGE—2 sheets, G, GH, K—2 sheets, NY, P, UC, W). Figure 4.

Fuchsia mollis Krause, Engl. Jahrb. 37: 600. 1906. TYPE: Brazil. Rio de Janeiro: in forest near Nova Friburgo, 900 m, Oct. 1896, *E. Ule* 4418 (holotype, B, destroyed in World War II, photograph at F; isotypes, CORD, R—#41706, RB).

Scandent shrubs 1–5 m tall, branches generally long and hanging, up to 5 m long. Branchlets reddish tan, densely pilose with erect, whitish hairs

ca. 1 mm long. Leaves opposite, occasionally ternate, membranous, oblong, broadly ovate or narrowly elliptic-ovate, (55–)60–140 mm long, 20–70 mm wide, apex acute to acuminate, base rounded to subcordate or subauriculate, moderately pilose above, densely pilose below, sometimes purple-flushed when young, often yellowing before dehiscing; margin entire to subdenticulate, secondary veins 5–9(–10) per side. Petioles densely pubescent, 3–6 mm long, stout and 2–4 mm thick on older leaves, canaliculate above. Stipules narrowly triangular, 1–2 mm long, 0.8–1.5 mm wide, adjacent ones sometimes fused, generally covered by hairs. Flowers few and solitary in upper leaf axils; pedicels pendulous, 25–40 mm long. Ovary

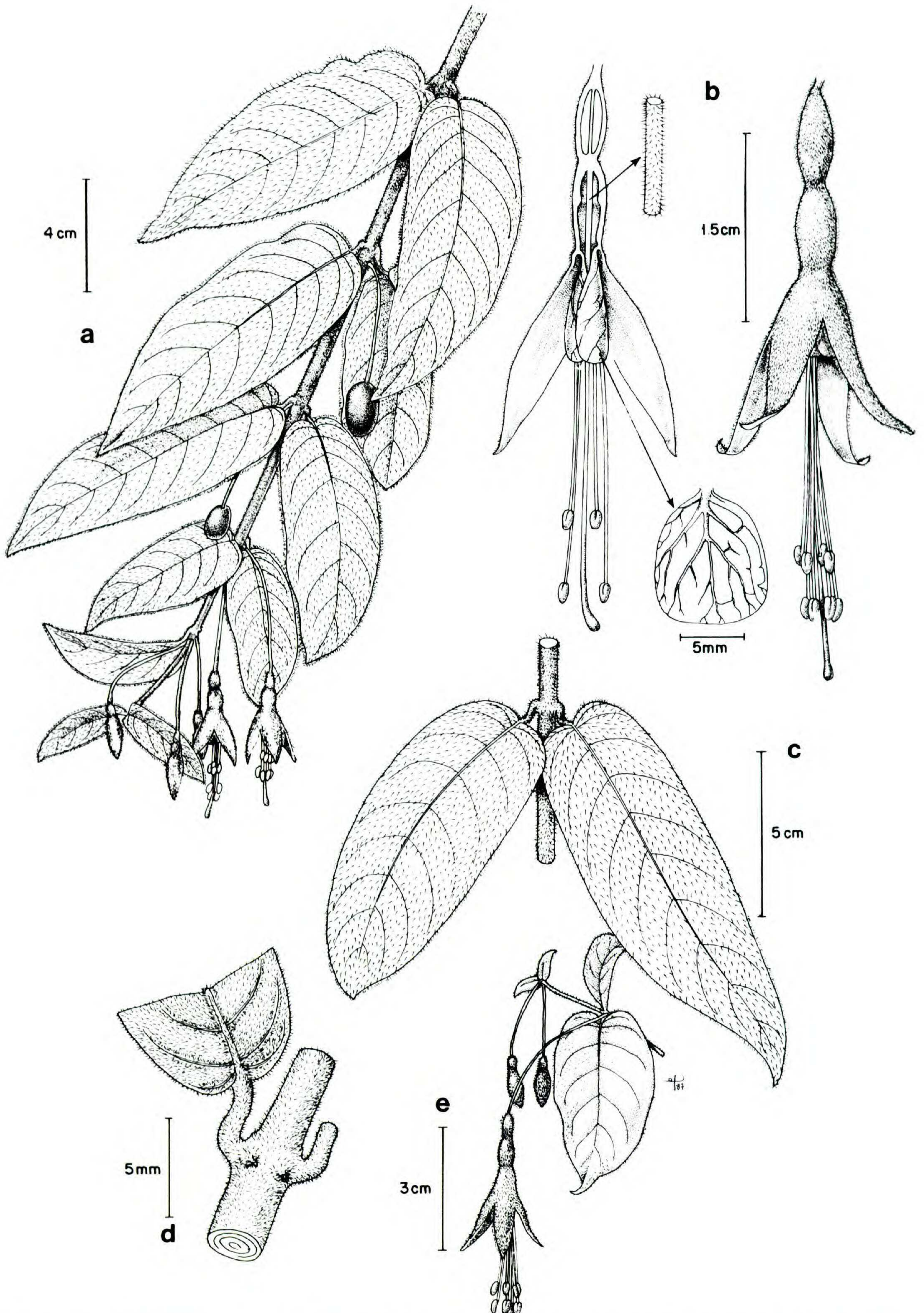


FIGURE 4. *Fuchsia alpestris*.—a. Flowering branch.—b. Details of entire and longitudinally split flower.—c. Pair of large leaves from basal portion of stem.—d. Detail of young stem with stipules and petioles.—e. Tip of flowering shoot with nearly sessile leaves. From *Berry et al.* 4418.

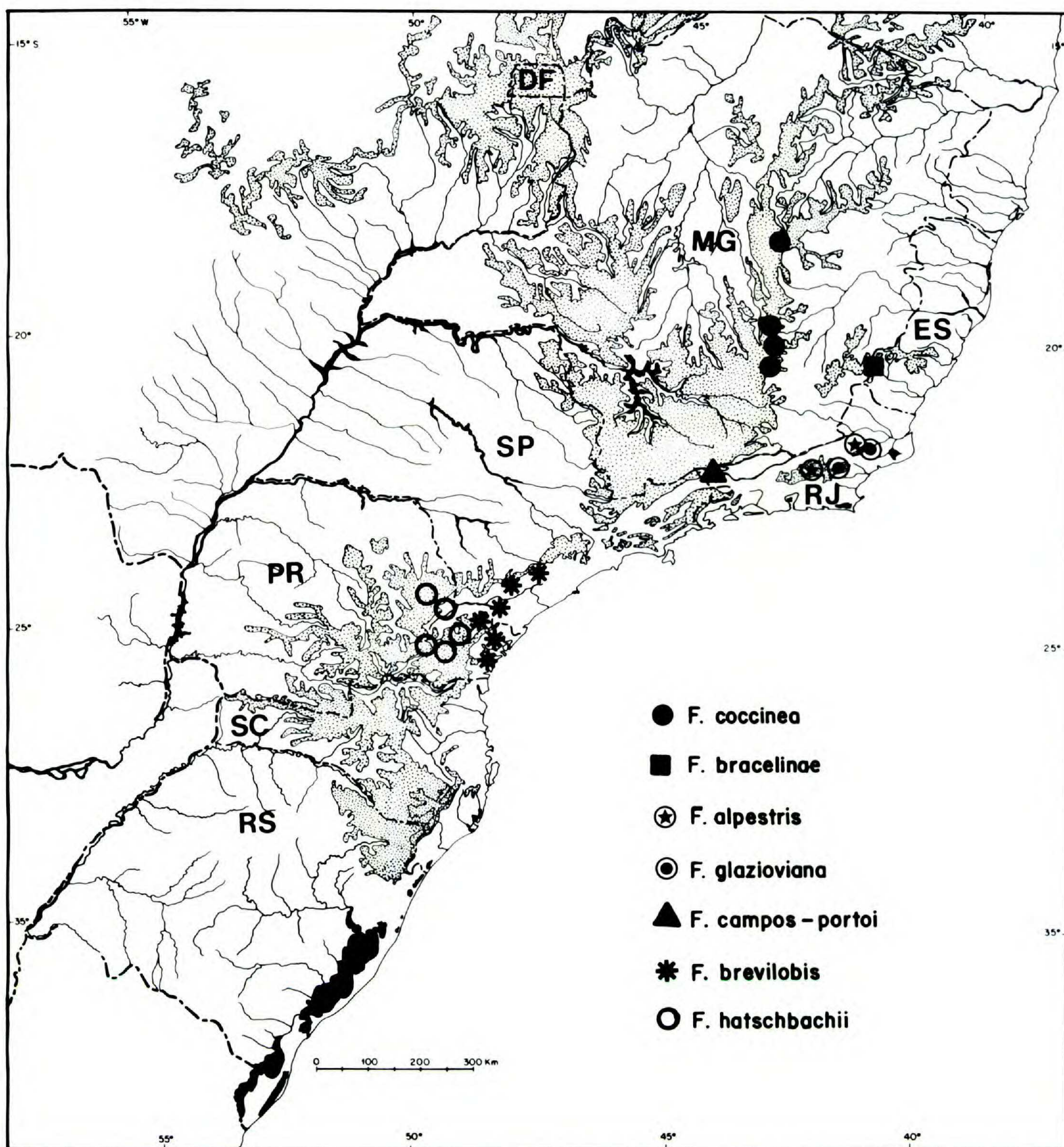


FIGURE 5. Geographical distributions of the Brazilian species of *Fuchsia* sect. *Quelusia*, except for *F. regia*. Contours higher than 800 m are indicated by the stippled areas. Capital letters are state abbreviations. MG = Minas Gerais, ES = Espírito Santo, RJ = Rio de Janeiro, SP = São Paulo, PR = Paraná, SC = Santa Catarina, RS = Rio Grande do Sol.

subquadrangular, pilose, 6–8 mm long, 2–3.5 mm wide. Floral tube cylindrical-fusiform, (5–)6–8(–10) mm long, 3–4 mm wide, pubescent outside, pilose inside; nectary 4–6 mm high, 1 mm thick, irregularly ridged. Sepals 18–26(–28) mm long, connate for 4–6 mm at the base, pilose outside; free lobes 3.5–4.5 mm wide at base, spreading at anthesis. Tube and sepals red to dull pink. Petals violet, broadly obovate, 10–14 mm long, 8–9 mm wide. Filaments red, 26–35 mm and 24–32 mm long; anthers red, oblong, 2.5–3.5 mm long, 1.2–

1.6 mm wide. Style red, pilose in basal 1/3; stigma red, clavate, 2.5–3.5 mm long, 1.1–1.6 mm wide. Berry oblong-ellipsoid, 14–16 mm long, 8–10 mm wide, purple when ripe; seeds oblong, 1.8–2.2 mm long, 1–1.5 mm wide. Gametic chromosome number $n = 22, 44$.

Distribution (Fig. 5). In thickets and low forest near granitic outcrops of several morros in north-central Rio de Janeiro state, Brazil: near Nova Friburgo, Santa Maria Madalena, and in the

Serra dos Órgãos between Teresópolis and Petrópolis, (1,100–)1,400–1,600 m. Flowers mainly from November to March.

Additional specimens examined. BRAZIL. RIO DE JANEIRO: Teresópolis, *Bailey & Bailey 1296* (BH), *von Bayern 19539* (F, NY), *von Bayern in Sep. 1888* (M); 26 km SE of Itaipava, road from Teresópolis to Petrópolis, *Berry et al. 4418* (MO, RB; $n = 22$); Fazenda Portugal, Serra dos Órgãos, *Brade 19467* (RB); Canoas, Sítio Sumare II, Teresópolis to Nova Friburgo, *Braga 1535* (RB); Petrópolis, *Rgl. 55-11, 56.9* (LE); Morro do Sertão, Petrópolis, *Goés & Dionisio 427* (RB); Araras, Mun. Petrópolis, *Martinelli & Sucre 216* (RB); Araras, Morro Bolo de Milho, *Sucre & Braga 2808* (RB); Nova Friburgo, *Riedel 534* (LE), *Fomnov 4418* (CORD); Pedra Dubois, Santa Maria Madalena, *Anderson 11724* (MO).

Cultivated specimens. U.S.A. CALIFORNIA: Berkeley, from Brazilian plant, *Bracelin 2575* (RSA). THE NETHERLANDS: Hollandsche Rading, *Berry & Brako 001-86* (MO; $n = 44$). Also seen cultivated in England and France.

Munz (1943) treated *Fuchsia alpestris* as a variety of *F. regia*, but the former can be readily distinguished from *F. regia* by having large, mostly opposite, short-petioled leaves. The older leaves have a characteristic subcordate base, and the entire plant has characteristic dense, pale pubescence. The flowers are considerably smaller and often much paler than those of the subspecies of *F. regia* that occurs in the same area.

This species is rare in nature and is apparently confined to shrubby patches bordering exposed rock on the flanks of large, granitic domes. *Fuchsia regia* subsp. *regia* always occurs nearby, and some intergradation between the two species has been found at Pedra Dubois, near Santa Maria Madalena (see Appendix).

2. *Fuchsia bracelinae* Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 7, pl. 1, fig. 2. 1943. TYPE: Brazil. Espírito Santo: Serra do Caparaó, rocky open campo, 2,650 m, 25 Nov. 1929, *Ynes Mexia 4013* (holotype, GH, photograph at BH; isotypes, A, BM, CAS, G—DEL, GH, MO, NY, P, S, UC, US, Z). Figure 6.

Few- to many-branched subshrubs 10–60 cm tall, or occasionally scandent shrubs to 2 m high in dense shrubbery. Branchlets terete, generally reddish purple, densely pilose with erect, whitish hairs ca. 1 mm long; older branches with freely exfoliating bark. Leaves 3–5-verticillate, membranous, narrowly elliptic-lanceolate, 20–50 mm long, 7–17 mm wide, apex narrowly acute, base rounded, green and slightly strigose above with conspicuously impressed veins, paler and usually purple-flushed below and densely pilose on the sulcate veins and margins; margin subentire to gland-denticulate, secondary veins 4–7 per side. Petioles

green to reddish, pilose, 1–3 mm long. Stipules lanceolate, with a thick base, 1.5–2 mm long, adjacent ones often fused basally, subpersistent. Flowers solitary in upper leaf axils; pedicels slender, pilose, pendulous, 12–20 mm long. Ovary oblong, strigillose to pilose, 4.5–8 mm long, 2–3 mm wide. Floral tube cylindrical-fusiform, 3.5–7 mm long, 2–4 mm wide, lightly strigillose to pilose outside, glabrous inside; nectary 2.5–3.5 mm high, ca. 1 mm thick and slightly ridged. Sepals 19–26 mm long, narrowly lanceolate to elliptic-ovate, connate at the base for 3–5(–6) mm; free lobes 5–8 mm wide at the base, apex acuminate, spreading at anthesis. Tube and sepals light red to pink. Petals deep violet, broadly obovate, 10–15 mm long, 6.5–9 mm wide, apex rounded. Filaments reddish purple, 24–30 mm and 17–21 mm long; anthers elliptic, 2.5–3 mm long, 1.2–1.6 mm wide. Style light red, glabrous; stigma reddish, clavate to subglobose, 1.5–3 mm long, 1–1.5 mm wide, exerted 5–14 mm beyond the anthers. Young fruits oblong, mature ones not seen. Gametic chromosome number $n = 22$.

Distribution (Fig. 5). Endemic to the highest peaks of the Serra do Caparaó (Pico da Bandeira, Pico do Cristal, Pico do Cruzeiro, and Pico do Calçado) along the border of the states of Minas Gerais and Espírito Santo. Grows in open campo above treeline, between 2,280 and 2,850 m, most common at 2,700–2,800 m. Flowers in the summer, principally from November until March.

Additional specimens examined. BRAZIL. ESPÍRITO SANTO: Pico da Bandeira, *Berry 4524* (MO, RJ; $n = 22$), 4530, 4532, 4533, 4534, 4535 (MO, RJ; $n = 22$); *Irwin 2745* (F, MICH, NY, R, TEX, UC). MINAS GERAIS: Pico da Bandeira, *Berry 4525* (MO, RJ), 4531 (MO, RJ; $n = 22$); Campos de Caparaó, *Ule in 8 Feb. 1890* (R #41703); *Schwacke in 8 Feb. 1890* (R #41702); Serra do Caparaó, *Torgo 6* (HB, MBM).

Fuchsia bracelinae is distinguished from other members of the section by having dense, stiff pubescence and small, narrow, verticillate leaves. It inhabits only the rocky, open campos of the highest peaks of southern Brazil, in the Serra do Caparaó. Individuals are found along rocks, in meadows, or in protected shrub and bamboo patches. This area is subject to frequent and severe winter frosts, and *F. bracelinae* is found to within 60 m of the 2,897-m-high summit of Pico da Bandeira. Extensive winter dieback of the above-ground stems probably accounts for the small stature of most plants, but underground stems lead to extensive vegetative reproduction in areas with good soil accumulation.

Fuchsia regia occurs lower down on the same mountain range, but there is no sympatry at pres-

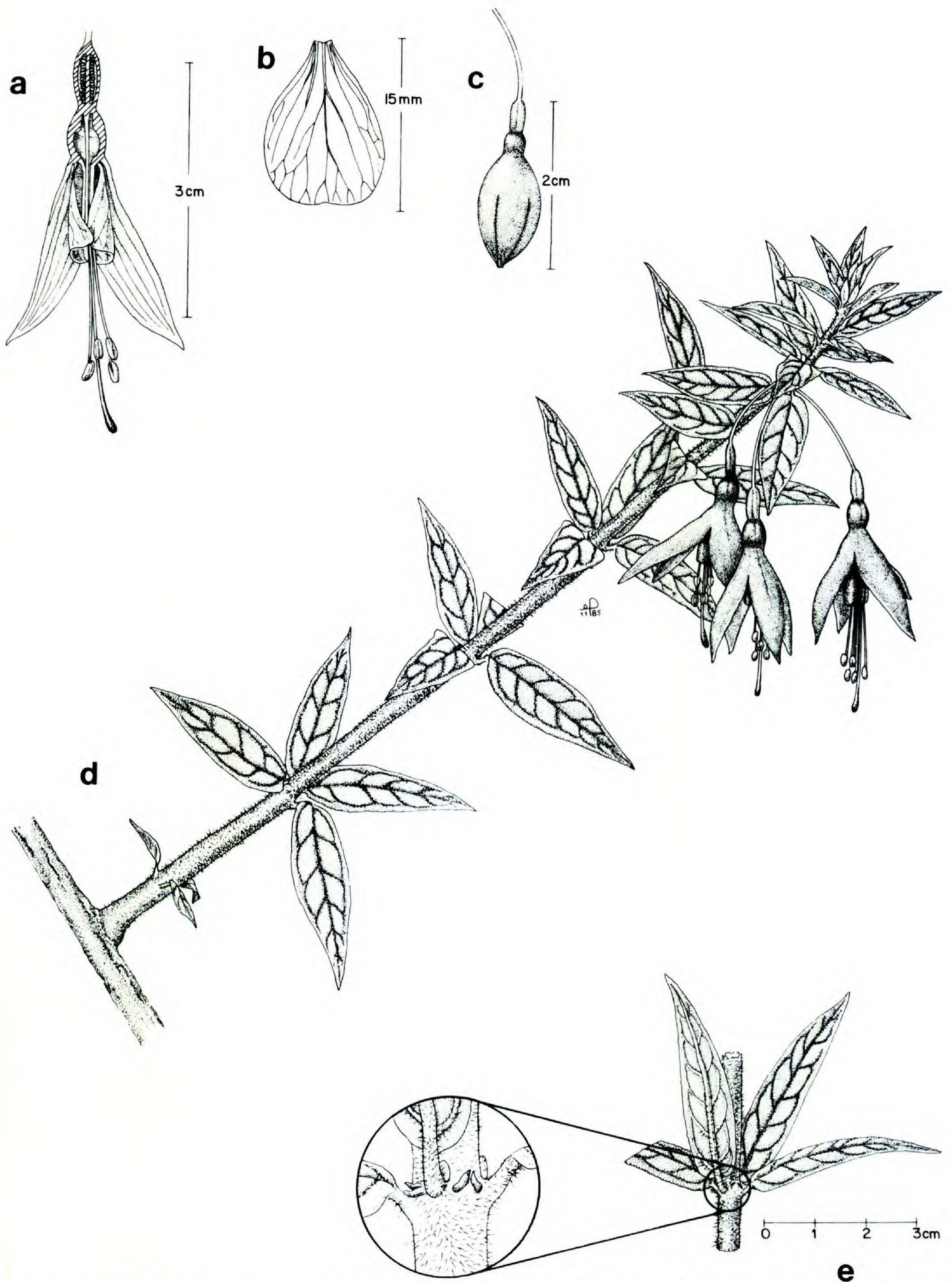


FIGURE 6. *Fuchsia brachelinae*.—a. Detail of flower in longitudinal section.—b. Petal, spread open.—c. Floral bud just prior to anthesis.—d. Flowering branch.—e. Leaf whorl and detail of stipules and petioles. From *Berry et al.* 4524.

ent; extensive forest areas at intermediate elevations existed until the past century but have been eliminated by cutting and fires. The collection *Irwin* 2808 (US #2324661; Serra do Caparaó, 2,600

m) has narrow, moderately dentate leaves that resemble *F. campos-portoi*, but the *Irwin* collection is probably just a stunted individual of *F. brachelinae*.

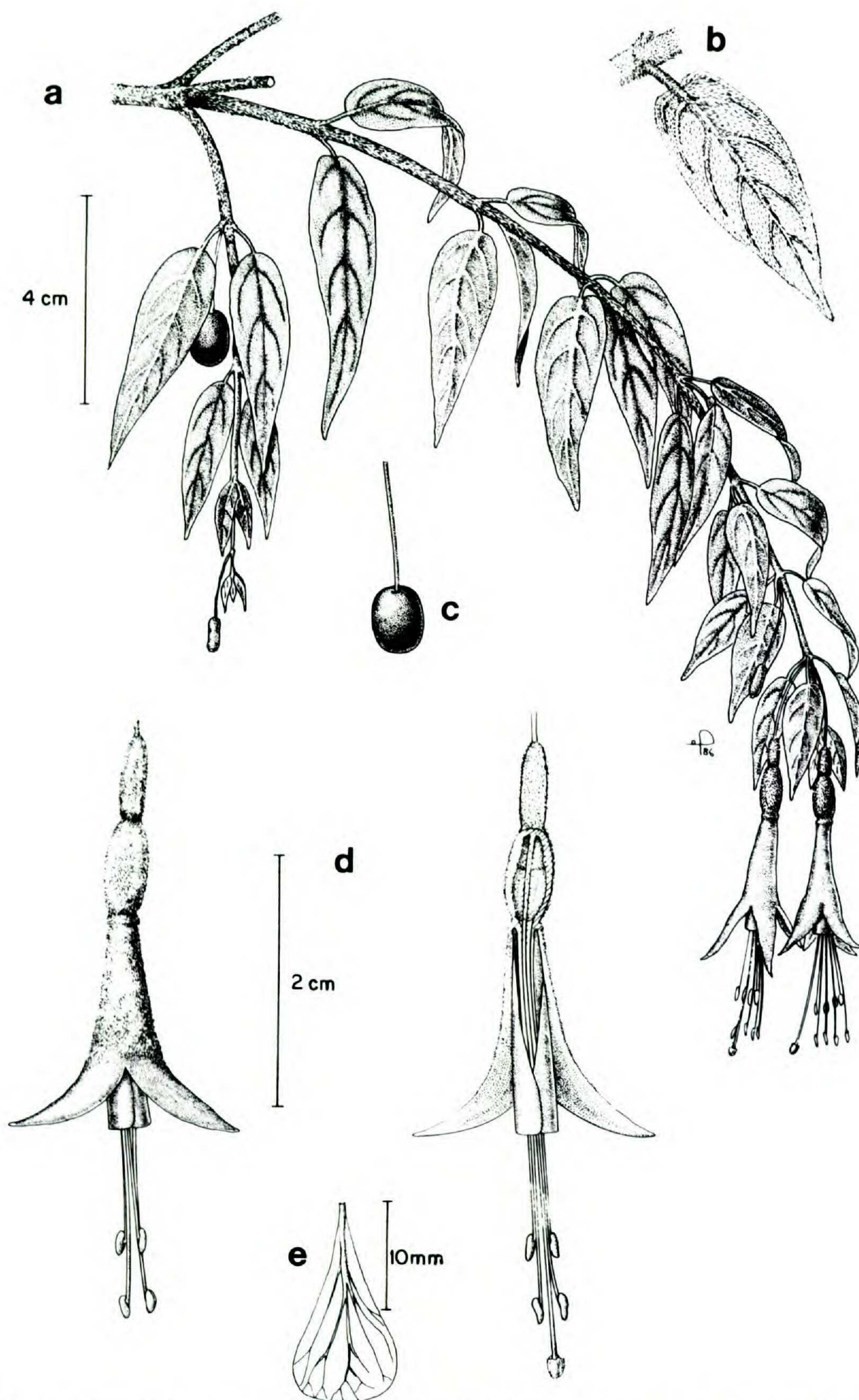


FIGURE 7. *Fuchsia brevilobis*. —a. Flowering branch. —b. Leaf detail. —c. Ripe fruit. —d. Detail of entire and longitudinally split flower. —e. Petal, spread open. From *Berry et al.* 4441.

3. *Fuchsia brevilobis* P. Berry, sp. nov. TYPE: Brazil. São Paulo: 38 km NE of the São Paulo-Paraná border near the 267 km post on Highway 116, bamboo forest on marshy ground, 680 m, 8 Mar. 1976, *Gerrit Davidse, T. P. Ramamoorthy & D. M. Vital* 10902 (holotype, MO #2931564; isotype, SP (under *Da-*

vide & D'Arcy 10902); $n = 22$, $2n = 44$. Figure 7.

Frutex scandens, ramulis foliisque junioribus puberulentibus vel pilosis. Folia membranacea, lanceolata vel elliptico-ovata, basi rotundata, apice acuta, 2–7.5 cm longa, 1–3 cm lata, nervis secundariis 3–6; petiolis (2–)4–8(–14) mm longis. Tubi florales fusiformes 7–10

mm longi. Sepala 17–25 mm longa, basi (8–)11–16 mm connata, lobis liberis 5–11(–13) mm longis. Petala spatulata 12–18 mm longa, 5–7 mm lata, a tubo sepalorum fere occulta. Numerus gameticus chromosomatum $n = 22$.

Scandent shrubs 2–6 m tall, or occasionally lianas in trees to 8 m high, with basal stems 1–6 cm in diameter; branches scandent or drooping to 3 m long. Young growth densely pilose to puberulent, older stems exfoliating. Leaves opposite, ternate or occasionally in whorls of 4, firmly membranous, lanceolate to narrowly ovate, 20–75 mm long, 10–25(–30) mm wide, acute to occasionally acuminate at the apex, rounded at the base, subglabrous to sparsely pubescent above with impressed veins, sparsely puberulent to villous below, especially along nerves; margin entire to remotely denticulate, secondary veins 3–6 per side. Petioles usually dull purple, (2–)4–8(–14) mm long, subglabrous to densely pilose. Stipules 0.5–1.1 mm long, 0.7–1.2 mm wide, purplish, broadly triangular, thick-stubby and divergent, deciduous. Flowers solitary in upper leaf axils; pedicels pendulous, 17–28(–42) mm long. Ovary oblong, 5–10 mm long, 2–4 mm wide, loosely pilose, green. Floral tube subcylindric to fusiform, 7–10 mm long, 2–3 mm wide at the base, 3.5–4.5 mm wide in the middle, often constricted to ca. 3 mm wide at the point of insertion of the stamens beneath the widening of the sepal tube, glabrous to pilose outside, pilose inside; nectary green, slightly ridged, 1–1.2 mm thick and 2.5–3 mm high. Sepals 17–25 mm long, connate for (8–)11–16 mm at the base and forming a tube, this enlarging to 8–10 mm wide before the separation of the sepals; the free lobes narrowly triangular, 5–11(–13) mm long, 3–5 mm wide at the base, acute to acuminate at the apex, spreading to slightly recurved at anthesis. Tube and sepals red to red-pink. Petals almost entirely enclosed by the sepal tube, light to dark purple, spatulate, 12–18 mm long, (5–)6–7 mm wide, rounded at the apex, the base slender and adnate to the sepal tube in the basal 3–4 mm above the insertion of the filaments. Filaments reddish pink, 22–38 mm and 19–35 mm long; anthers red-purple, oblong, 2.5–3 mm long, 1–1.5 mm wide. Style reddish, pilose in lower half; stigma clavate, purple, 1.2–1.6 mm long, ca. 1 mm wide, exerted 5–10 mm beyond the anthers. Berry oblong-ellipsoid, 15–22(–26) mm long and 7–10(–16) mm wide at maturity, black when ripe; seeds oblong-triangular, 2–2.6 mm long, 1–1.6 mm broad, ca. 0.5 mm thick. Gametic chromosome number $n = 22$.

Distribution (Fig. 5). In montane forest of the Serra de Paranapiacaba in southern São Paulo

state; in Paraná state in the Serra da Virgem Maria and Rio Capivari drainage, and then on the lowermost slopes of the Serra do Mar and in coastal restingas, from sea level to 900 m. Flowers throughout the year, principally from November to March.

Additional specimens examined. BRAZIL. SÃO PAULO: Reserva Carlos Botelho, between São Miguel Arcanjo & Sete Barras, *Prance et al.* 6860 (MBM, SP, UEC); Reserva Capão Bonito, 70 km S of Itapetininga, *Sakane* 543 (SP); 50 km S of Itapetininga, *Gibbs et al.* 3279 (SP, UEC); Juquiá to Tapiraí (on BR-478 S of Piedade), *Yamamoto* 14653 (UEC); 38 km NE of SP-PR border, km 267 of BR-116, *Davidse & D'Arcy* 10904 (MO); Apiaí-São Paulo, km 294, *Vianna in* 5-5-64 (ICN #2820). PARANÁ: Prainhas, Mun. Morretes, *Hatschbach et al.* 13412 (MBM, U); *Cordeiro et al.* 215 (MBM; $n = 22$); below Eng. Lange train station to Prainhas, *Cordeiro et al.* 218 (MBM; $n = 22$); Porto da Cima, Mun. Morretes, *Berry et al.* 4495 (MBM, MO; $n = 22$); *Dusén* 11964 (S), 14133 (G—DEL, K, S, US), 14340 (A, S); *Hatschbach* 43303 (MBM); Sesmária, 2–5 km W of Rio Capivari, Mun. Bocaiúva do Sul, *Berry & Juarez* 4441 (MBM, MO; $n = 22$), 4442, 4443, 4444, 4445 (MBM, MO); *Hatschbach* 20936 (HB, MBM, UC); *Hatschbach & Ramamoorthy* 42973 (MBM, MO), 42974 (MBM); 10 km E of Curitiba, *Lindeman & Haas* 2539 (MBM, U); Estrada da Graciosa, Serra do Mar, 850 m, *Lindeman & Haas* 5879 (U); road Rio Taquary–Rio Divisa, Mun. Campina Grande do Sul, *Hatschbach* 7009 (MBM); Serra Virgem Maria, Mun. Campina do Sul, *Hatschbach* 20284 (M, MBM, MO, UC); Rio Guaraguaçu, Mun. Paranaguá, *Hatschbach* 7056 (MB); Rio São Joãozinho, Mun. Paranaguá, *Berry et al.* 4496 (MBM, MO); *Falkenberg* 2234 (ICN); Sapitanduva (cultivated), *Berry et al.* 4494 (MBM, MO); *Falkenberg* 2222 (FLOR); Mun. Antonina, Cacatu, *Hatschbach et al.* 50788 (MBM; $n = 22$); Mun. Campina Grande do Sul, Rodovia BR-2, Ribeirão do Cedro, *Hatschbach* 8946 (MBM).

Fuchsia brevilobis is distinguished by its remarkably long sepal tube, which almost entirely encloses the petals, and by the membranous, pubescent, narrowly ovate leaves. There are two distinct areas where this species occurs, with notable morphological differences in their populations. In the low ramifications of the Serra do Mar in northern Paraná and southern São Paulo states, plants grow between 700 and 900 m and are very pubescent, with especially long sepal tubes. Another group of populations is found on the lower, eastern flanks of the Serra do Mar in central Paraná, from 400 m to sea level. Most plants from these populations have longer petioles than those of higher altitude, and they vary considerably from population to population in color (dull pink to bright red), degree of sepal connation, and leaf shape and texture.

Several populations of *F. brevilobis* occur in the restinga or swamp forest close to sea level, a very

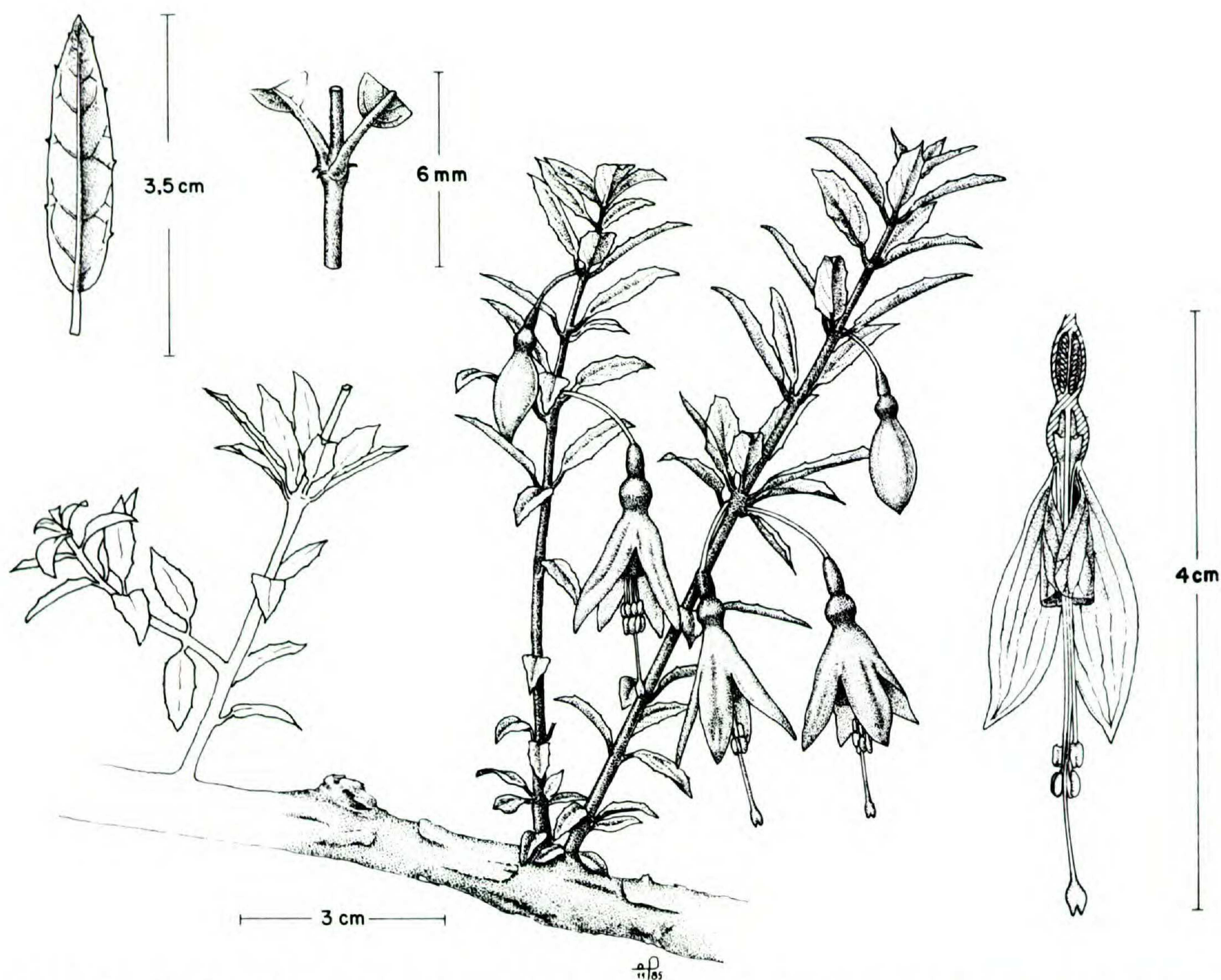


FIGURE 8. *Fuchsia campos-portoi*. Flowering shoots with details of an individual leaf underside, a leaf node with stipules, and a longitudinally divided flower. From Berry *et al.* 4435.

unusual habitat for Brazilian fuchsias. These plants grow as lianas and are found along rivers or streams, perhaps enabling them to withstand the heat and high evapotranspiration of the Atlantic lowlands. The population from Cacatu has unusually narrow, lanceolate leaves with acuminate tips.

Throughout most of its range, this species is sympatric with *F. regia* subsp. *serrae*. The presence of plants morphologically intermediate between the two taxa indicates that hybridization has occurred between them (see Appendix). The populations of *F. regia* subsp. *serrae* in northern Paraná have exceptionally long sepal tubes, which may be the result of introgression with *F. brevilibis*.

4. *Fuchsia campos-portoi* Pilger & Schulze, Notizbl. Bot. Gart. Berlin-Dahlem 12: 470. 1935; Rodriguésia 2: 94, figs. 1–5. 1935. TYPE: Brazil. Rio de Janeiro: Itatiaia, Serra da Mantiqueira, 2,200 m, 27 Dec. 1934, *Robert Pilger & Curt Brade 31* (holotype, B, destroyed in World War II; lectotype, RB, here designated; isotype, BH). Figure 8.

Subshrubs to woody scandent bushes 0.3–2 (–3) m tall, often growing among rocks. Young growth subglabrous to finely canescent or pilose; older stems 1–4 cm thick, with flaky, coppery brown bark. Leaves mostly ternate, occasionally opposite or 4–5-whorled, firmly membranous, narrowly elliptic-lanceolate, 12–40 mm long, 2–6(–8) mm wide, narrowly acute at the apex, acute to cuneate at the base, dark green and subglabrous above, paler and mostly glabrous below or with villous hairs along veins and margins; margin gland-serrulate, with teeth angled towards the apex, secondary veins 3–7 per side, at times inconspicuous; internodes short, mostly 10–16 mm long. Petioles (2–)3–8 mm long. Stipules 0.5–1 mm long, narrowly lanceolate or filiform, deciduous. Flowers solitary in upper leaf axils; pedicels slender, pendulous, (4–)8–20 mm long. Ovary oblong, 4–5 mm long, ca. 2 mm wide, strigose to strigillose. Floral tube subrhombic, 4–6 mm long, 3.5 mm wide in the middle and ca. 2.5 mm wide at the base and summit, glabrous to strigose outside, glabrous inside; nectary 2.5–3 mm high, shallowly 8-lobed. Sepals 12–20 mm long, lance-elliptic, con-

nate for 3–5 mm at the base; free lobes 4–7 mm wide at base, spreading at anthesis. Tube and sepals red to dark pink. Petals violet, broadly obovate, 9–12 mm long, 7–8 mm wide, rounded to slightly retuse at the apex. Filaments red, 15–28 and 13–25 mm long; anthers purple-red, elliptic-oblong, 1.5–2 mm long, 1–1.5 mm wide. Style glabrous, exserted 5–10 mm beyond the anthers; stigma clavate, 1.2–2 mm long, 0.7–0.9 mm wide. Berry cylindrical-oblong, 14–16 mm long, 7–8 mm thick; seeds 1.3–1.6 mm long, 0.7–1.1 mm wide. Gametic chromosome number $n = 22$.

Distribution (Fig. 5). Endemic to the open campos of the Itatiaia mountain massif, in the Serra da Mantiqueira, Rio de Janeiro and Minas Gerais border, from 2,100 to 2,550 m. Flowers mainly during the summer, from November to March.

Additional specimens examined. BRAZIL. RIO DE JANEIRO: Ayuruoca, *Glaziou* 15948 (K, P); Itatiaia (Planalto), *Andrade & Emerich* 626 (R); *Aparicio & Edmundo* 826 (MO, RB); *Badini* 22993 (OUPR); *Berry et al.* 4435 (MO, RB; $n = 22$), 4436, 4438 (MO, RB), *Brade* 15160 (R, RB), 15676 (RB, POM, photos at NY, R, UC), 18008 (R, RB, S), 20335 (R); *Campos Porto* 2705 (R, RB), *Duarte* 826 (US); *Dusén* 178 (R); *Gounelle in Jan.* 1899 (G—BOIS); *Glaziou* 4801 (P), 6522 (K, R); *Hatschbach et al.* 35833 (MBM, UC, Z); *Hoehne* 11918 (POM); *Koyama et al.* 13701 (SP); *Lindeman & de Haas* 4120 (MBM, U); *Lobo* 4 (R); *Loefgren* 5775 (SP); *Lutz in Nov.* 1950, *in Jan.* 1957, *in Nov.* 1958 (R); *Lutz & Sampaio in Feb.* 1954 (R); *Merxmuller* 25591 (M); *Pabst* 9308 (HB, K, M, MBM); *Pereira* 7037 (HB, MBM, PEL); *Pereira & Pereira* 7578 (B, HB, R, RB); *Ramamoorthy* 104 (MO), 814 (MBM, MO), s.n. (MO; $n = 22$); *Santos* 5169 (DS); *Sucre* 4645 (MO, RB); *Ule* 118 (R); *Vianna* 771 (R).

Fuchsia campos-portoi is readily distinguished from other fuchsias by its small and very narrow, gland-serrulate leaves. It also has unusual, small flowers; the floral tube is nearly rhombic and very short, whereas the sepals are up to four times as long and are noticeably inflated in bud.

This species inhabits the high-elevation campos of the Itatiaia massif, where it grows in shrubby patches or in open, rocky sites. Winter frosts are common in this area. Populations of *F. regia* subsp. *regia* grow together with *F. campos-portoi*, and several intermediate plants have been found that indicate the occurrence of local hybrids (see Appendix).

5. *Fuchsia coccinea* Dryander in Aiton, Hort. Kew., 1st edition, 2: 8. 1789. Sims, Bot. Mag. tab. 97. 1789. Mordant de Launay, Herb. Gen. Amat. 2: 89, fig. 1817. Hook., Bot. Mag. 94: tab. 5740. 1868. *Nahusia coccinea*

(Dryander) Schneevogt, Icon. Pl. Rar. 1: 21. 1792. *Fuchsia elegans* Salisbury, Ic. Stirp. Rar., 13, tab. 7. 1791, nom. illeg. (Salisbury thought he would avoid confusion in renaming *F. coccinea*, since all species known at the time had red flowers.) *Fuchsia pendula* Salisbury, Prodr., 279. 1796, nom. illeg. (based on *F. elegans* Salisbury). TYPE: From a plant cultivated in 1788 at Kew Gardens, London, England, "Oct. 1788, Hort. Kew" (lectotype, LINN #670.3, Smith Herbarium, here designated: see Fig. 9; isotype, BM). Figures 9, 10.

Fuchsia montana Cambessèdes in St. Hilaire, Fl. Brasil. Merid. 2(17): 275, tab. 135. 1830. TYPE: Brazil. Minas Gerais: near the summit of the Serra da Carça, Dec. 1816–Mar. 1818, *Auguste St. Hilaire* B1 449 (holotype, P; isotype, P).

Erect shrubs 0.5–1.5 m tall, or scandent to 7 m high, often with extensive underground stems. Young growth puberulent to densely pilose, older stems 5–20 mm thick, with exfoliating bark. Leaves mostly ternate, sometimes opposite or in 4s, membranous or rarely subcoriaceous, narrowly ovate to ovate, 15–55 mm long, 7–25 mm wide, acute to subacuminate at the apex, subcordate or sometimes rounded at the base, generally dull, light green, paler below, sometimes strongly purple-flushed, subglabrous to puberulent on both sides, but generally densely pilose along the basal 1/3 of the midvein below; margins serrulate or occasionally subentire, secondary veins 4–6 per side. Petioles short and stout, ca. 1 mm thick, 1–3 mm long, occasionally longer on basal leaves, usually densely pilose or hirsute. Stipules narrowly lanceolate, 0.8–1.4 mm long, deciduous. Flowers solitary in the upper leaf axils; pedicels slender, pubescent, 18–42(–50) mm long, divergent or arching from the stems and pendent only in the distal third. Ovary oblong-ellipsoid, 5–9 mm long, 2.5–3 mm thick. Floral tube fusiform, 5–10 mm long, 2.5–3 mm wide at the base, 3.5–4.5 mm wide in the middle and 3–4 mm wide at the top, subglabrous to puberulent outside, puberulent inside; nectary smooth, 2–3 mm high. Sepals 15–24 mm long, oblong-lanceolate, lightly pubescent, connate at the base for 4–7 mm; free lobes 3.5–6 mm wide, acute at the apex, spreading at anthesis. Tube and sepals red to dark pink. Petals violet, obovate, 7–10 mm long, 6–8(–9) mm wide. Filaments red-purple, 18–38 mm and 13–30 mm long; anthers purplish, 2–2.5 mm long, ca. 1.5 mm wide. Style puberulent, red; stigma clavate, 1.5–2 mm long, exserted 5–15 mm beyond the anthers. Mature berry ellipsoid,

14–17 mm long, ca. 12 mm thick, purple; seeds oblong-triangular, 1.4–1.9 mm long, 0.8–1.2 mm wide. Gametic chromosome number $n = 22$.

Distribution (Fig. 5). Occurs in rocky, open campo near the summits of several of the highest mountains in Minas Gerais: Serra da Piedade, Serra da Caraça, Serra do Itacolomi, and Pico do Itambé, from 1,400 to 2,000 m. Flowers throughout the year, mainly from November to March.

Additional specimens examined. BRAZIL. MINAS GERAIS: E slopes of Pico do Itambé, Serra do Espinhaço, *Anderson et al.* 35832 (HB, MICH, MO, NY, U, W); Serra do Gavião, Pico do Itambé, *Windisch & Gillamy* 183 (HB); ascent to Pico do Itambé, Mun. San Antônio do Itambé, 18°24'S, 43°21'W, *Furlan et al.* 3058 (SPF); Serra da Piedade, N of Caete, *Badini, Herb.* #21373, 21374 (OUPR); *Berry et al.* 4553 (MO, RB; $n = 22$), 4554, 4555, 4556, 4557 (MO, RB), 4558 (MO, RB; $n = 22$); *Glaziou in 19 Nov. 1893* (P); *Hoehne* 6278, 6281 (POM), 6279, 6280 (R); *Irwin et al.* 28777 (K, MICH, MO, NY, RB, US), 30326 (MO, NY, RB, U, US); *Landrum* 4275 (MBM); *Magalhães Gomes* 1451 (R); *Mello Barreto* 7158, 7162, 8803 (F, BHMH), 7159 (BHMH, R), 7160 (F), 7161 (BHMH); *Pereira & Pabst* 2662 (MO); *St. Hilaire* 2276 (P); *Warming in 1907* (P); collector unknown (#3000) in Nov. 1839 (LE), unknown in Sep. 1824 (LE); Ouro Preto: Planalto do Pico Itacolomi, *Badini, Herb.* #26275 (OUPR); *Barboza* 1056 (R); *Bello* 249 (R); *Berry et al.* 4547, 4548 (MO, RB); *Damazio* 1337 (G—BOIS, HB, RB); *Falkenberg* 3381, 3382, 3383, 3385, 3386 (FLOR); *Glaziou* 14703 (K, LE); *Hoehne* 19661 (POM); *Magalhães Gomes* 3027, in 28 June 1896, in 20 Nov. 1893 (OUPR); *Mello Barreto* 9168 (BHMH, F); Morros de Vila Rica (Ouro Preto), *Martius s.n.* (M—2 sheets); Serra da Caraça, next to Pico do Sol, *Martinelli & Tavora* 2742 (RB); Serra da Caraça, *Pereira & Pabst* 2589 (MBM, RB), 2622 (HB, MBM, RB), *Silveira in July 1896* (R). No locality: *Clausen* 44 in Oct. 1839 (G), 88 in 1840 (BM); *Hausmann* 267E (RB); *Langsdorff in Sept. 1829, s.n.* (LE); *Netto in 1862* (R); *Schwacke* 13665 (MO, RB); *Vasconcellos in 25 Jan. 1901* (POM); *Vellozo?* (LE).

Cultivated specimens. AZORES: Flores, Bena Mao, *Pryor* 79 (BM); Flores, Ponta Delgada, *Gonçalves* 4256 (BM); Pico, Landroal, *Gonçalves* 4436 (BM); Faial, Horta Alagoa, *Gonçalves* 2278 (BM); São Jorge, Toledo, *Gonçalves* 3630 (BM). CANARY ISLANDS: Tenerife, Orotava, *Burchard* 177 (G—DEL, Z). JAMAICA: Green Hill, *Harris* 5824 (US); near Cinchona, *Harris* 9130 (BM), *Nichols in 16 July 1903* (NY). MADEIRA: Funchal, *Bornmüller* 605 (PH, W, Z); above São Jorge, *Pickering* 40 (PH); Jardim da Serra, *Mandon in July 1865-6* (G, G—BOIS, G—DEL). SUMATRA: Karo Highlands, E of Berastagi, *Hamel & Toroes* 624 (G). U.S.A. KENTUCKY: *Short in 1864* (PH).

The type sheets of *F. coccinea* are the earliest known specimens of this species, and both were taken from the plant at Kew Gardens upon which Dryander based his description (Hooker, 1869). The source of the plants is unclear; both Sims and



FIGURE 9. Photograph of the lectotype of *Fuchsia coccinea* from the Smith Herbarium at LINN.

Dryander described the species as a native of Chile, introduced to Kew by a Captain Firth. Salisbury (1791), on the other hand, stated that Vandelli introduced the species from Brazil around 1787.

Fuchsia coccinea is a rare species known from just four of the highest mountain ranges in Minas Gerais. It typically grows in rocky, open campo or occasionally in forest patches. It has long been confused in the literature with *F. magellanica*, but *F. coccinea* is easily distinguished by its ovate, subsessile leaves with a conspicuous tuft of long hairs at the base of the lower surface. Its divergent or arching pedicels also differ markedly from the fully pendent flowers of the other species in the section.

Fuchsia regia subsp. *regia* is known to occur sympatrically with *F. coccinea* at the Pico do Itambé and near the summit of the Serra do Itacolomi,

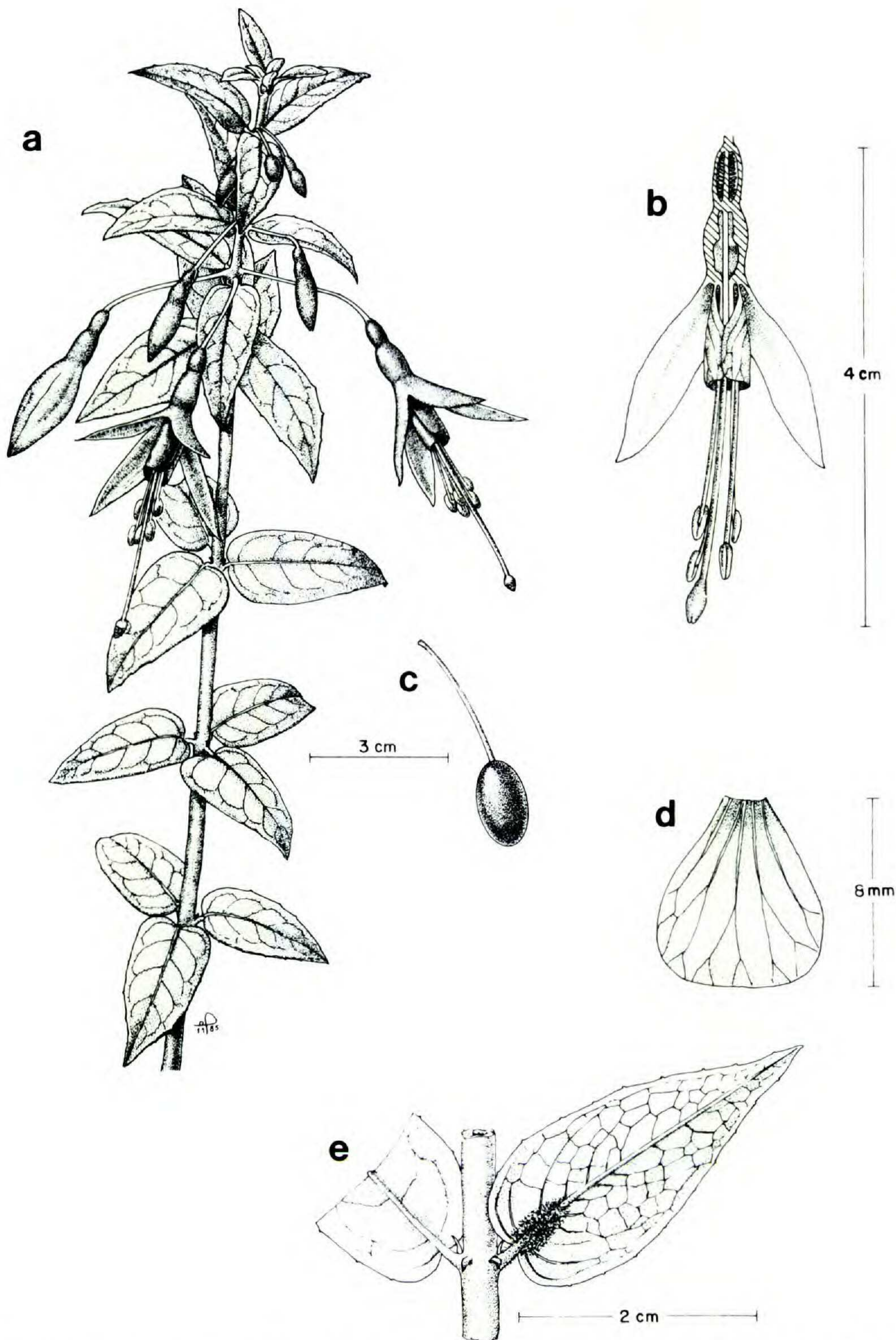


FIGURE 10. *Fuchsia coccinea*.—a. Flowering branch; note the characteristic arching pedicels.—b. Flower in longitudinal section.—c. Ripe fruit, same scale as (a).—d. Petal, spread open.—e. Pair of leaves from the lower stem, showing the cordate leaf base and typical tuft of hairs at the base of the abaxial midvein. From *Berry et al.* 4558.

which has been badly disturbed by fires and grazing. A series of intermediate variants between the two taxa indicates that hybridization has taken place in these areas (see Appendix).

6. *Fuchsia glazioviana* Taubert, Engl. Bot. Jahrb. 15, beibl. 34: 10. 1892. TYPE: Brazil. Rio de Janeiro: Alto Macahé de Nova Friburgo, 14 Aug. 1888 (fide specimen at R), *A. Glaziou 17614* (holotype, B, destroyed in World War II, photograph at F; lectotype, F,

here designated; isotypes, G, LE, LY, P, R #10152). Figure 11.

Fuchsia santos-limae Brade, Arq. Jard. Bot. Rio de Janeiro 15: 10, fig. 2. 1957. TYPE: Brazil. Rio de Janeiro: Santa Maria Madalena, Rochela, 30 May 1938, *J. Santos Lima 405* (holotype, RB #37704; isotype, HB #25471, with no collector number but same date of 30-V-38).

Shrubs 0.5–4 m high, often scandent in trees or low brush and with decumbent branches to 6 m long. Branchlets subdivaricate and generally

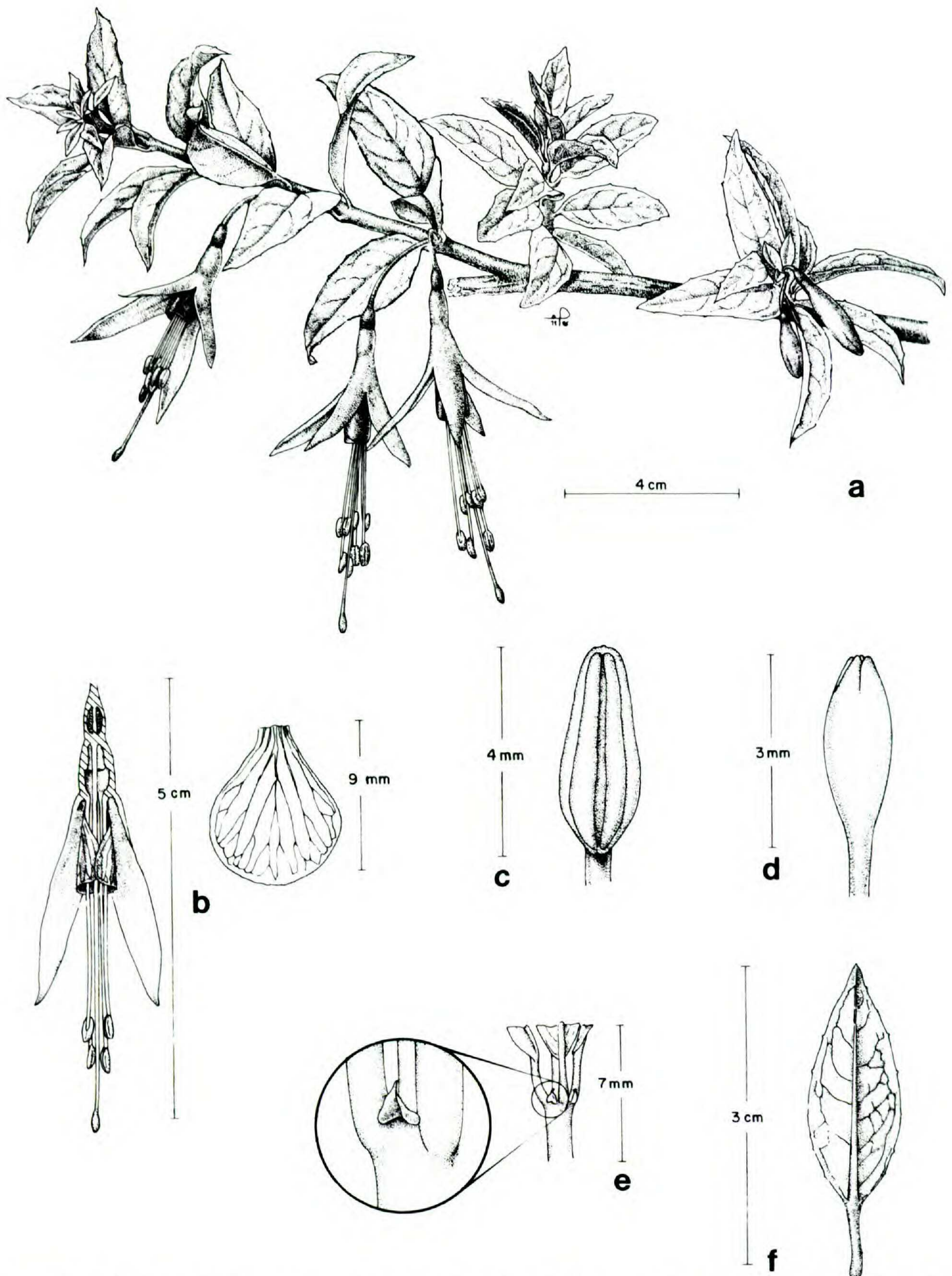


FIGURE 11. *Fuchsia glazioviana*.—a. Flowering branch.—b. Flower in longitudinal section and petal spread open.—c. Detail of anther.—d. Detail of stigma.—e. Detail of stipules.—f. Leaf underside. From *Berry et al.* 4422.

densely packed, minutely puberulent, dull purplish, readily exfoliating. Leaves opposite or ternate, firmly membranous to subcoriaceous, elliptic or lanceolate, 15–30(–40) mm long, 8–15 mm wide, acute at the base and apex, dark sublustrous green and glabrous above, paler and subglabrous below or sometimes pilose at the base of the midvein; mar-

gins remotely gland-denticulate, with 4–5(–6) secondary veins per side. Petioles 3–6 mm long, purplish and sparsely puberulent; internodes short, 3–12 mm long. Stipules broadly triangular, 0.6–1.2 mm long and wide, thick at the base, purplish, deciduous. Flowers solitary in the upper leaf axils; pedicels slender, sparsely puberulent, pendulous,

12–26 mm long. Ovary oblong, 4–5 mm long, 2–2.5 mm wide. Floral tube cylindrical, 5–7 mm long, 2.5–4 mm wide, subglabrous outside, glabrous inside; nectary smooth, 3–4 mm high. Sepals 17–22 mm long, narrowly lanceolate, connate at the base for 4–5 mm; free lobes 3–4 mm wide, acuminate at the apex, spreading at anthesis. Tube and sepals red or pink. Petals purple, obovate, 9–12 mm long, 6–9 mm wide, rounded at the apex. Filaments red-purple, 22–32 and 16–28 mm long; anthers oblong, 2.5–3.5 mm long, 1.1–1.6 mm wide. Style red, glabrous to puberulent; stigma clavate, 2–3 mm long and 1–1.4 mm wide, exserted 5–20 mm beyond the anthers. Berry shiny dark purple, subcylindrical, 10–16 mm long, 5–8 mm wide; seeds oblong, 2–4 mm long, 1–1.5 mm wide. Gametic chromosome number $n = 22$.

Distribution (Fig. 5). In open campo and in cloud forest on a few high mountains around the towns of Nova Friburgo and Santa Maria Madalena, in Rio de Janeiro state, from 1,500 to 2,100 m. Flowers throughout the year, mainly from November to March.

Additional specimens examined. BRAZIL. RIO DE JANEIRO: Nova Friburgo, Morro da Nova Caledônia, *Berry et al.* 4420 (MO, RB), 4422, 4423 (MO, RB; $n = 22$), 4426, 4428, 4431, 4434 (MO, RB); *de Lima* 530 (RB); *Martinelli et al.* 2540 (RB); *Pabst* 8134 (HB); Nova Friburgo au fond de la Bocaina do Conejo, *Glaziou* 12667 (F, K, LE, LY, P); Nova Friburgo, Morro da torre de TV, *Vianna et al.* 789 (MO); Santa Maria Magdalena, Pedra do Desengano, *Farney & Caruso* 1190 (RB); *Santos Lima & Brade* 13286 (RB, HB #25466, fragment).

Fuchsia glazioviana is distinguished by its small, tightly grouped, shiny, subcoriaceous leaves with short petioles. It is a local endemic known from only two mountains in the Serra do Mar of Rio de Janeiro, where it extends from upper cloud forest into open campo above treeline. On the Morro da Nova Caledônia, it is sympatric with *F. regia* subsp. *regia* in cloud forest habitats, and the two species hybridize locally (see Appendix).

7. *Fuchsia hatschbachii* P. Berry, sp. nov.

TYPE: Brazil. Paraná: Serra São Luiz do Purunã, BR-277, Mun. Campo Largo, 25 Jan. 1985, *P. E. Berry, T. Plowman & F. Juarez* 4458 (holotype, MO #3504627; isotype, MBM; $n = 22$). Figure 12.

Frutex erectus vel scandens 1–5 m altus. Folia plerumque opposita, anguste lanceolato-ovata, 3–11 cm longa, 0.8–3 cm lata, apice attenuata vel acuminata basi rotundata vel anguste subcordata, glabra; petiolis 2–6(–7) mm longis, interdum flexis ad basim laminae; stipulis parvis membranaceis 1–1.7 mm longis, 0.6–1.2 mm latis. Tubi florales cylindrici 10–15 mm longi, 3–5 mm lati.

Sepala 18–26 mm longa, 3.5–5 mm lata, basi connata 2–6 mm. Petala late obovata 12–17 mm longa, 8–12 mm lata. Numerus gameticus chromosomatum $n = 22$.

Erect to scandent shrubs 1–3 m tall or climbers in trees to 5 m above ground. Branchlets glabrous, dull purple, older branches ascending on small shrubs or decumbent in large or climbing plants. Leaves mostly opposite, occasionally in whorls of 3–4, firmly membranous to subcoriaceous, narrowly lance-ovate, generally 3 times longer than wide, 3.0–7.5(–11.0) cm long, 0.8–2.5(–3.0) cm wide, apex attenuate to acuminate, base rounded to narrowly subcordate, sublustrous dark green above, pale below and glabrous on both sides except for small tufts of hairs 0.8–1 mm long at the base of the lower midvein in some plants; margin remotely gland-denticulate, secondary veins 5–6(–7) per side. Petioles wine purple, (2–)3–6(–7) mm long, 1–2 mm thick, canaliculate above, at times making a marked angle at the junction with the midvein. Stipules narrowly triangular, 1–1.7 mm long, 0.6–1.2 mm wide, adjacent ones occasionally fused, semideciduous. Flowers glabrous and solitary in upper leaf axils; pedicels pendulous, (10–)20–30 mm long. Ovary cylindrical, 5–9 mm long, 2.5–3 mm wide. Floral tube cylindrical, 10–15 mm long, 3–5 mm wide; nectary 3–5 mm high. Sepals 18–26 mm long, connate at the base for 2–6 mm; free lobes 3.5–5 mm wide at the base, spreading at anthesis. Tube and sepals red. Petals violet, broadly obovate, 12–17 mm long, 8–12 mm wide. Filaments red, 40–45 mm and 32–40 mm long; anthers red-purple, 3–3.5 mm long, 1–1.5 mm wide. Style red, loosely pilose in lower half; stigma 2–3 mm long, 1–1.5 mm wide, exserted 15–20 mm beyond the anthers. Berry subcylindrical, \pm 4-angled, 13–18 mm long, 7–10 mm thick, purple when ripe; seeds oblong-triangular, 1.4–1.8 mm long, 0.8–1.2 mm wide. Gametic chromosome number $n = 22$.

Distribution (Fig. 5). In low forests on limestone or sandstone outcrops, in the planalto north and west of Curitiba, Paraná, between 950 and 1,150 m. Flowers mainly from November to March.

Additional specimens examined. BRAZIL. PARANÁ: Serra São Luiz do Purunã, BR-277, Mun. Campo Largo, *Berry et al.* 4459 (MBM, MO; $n = 22$), 4460, (MBM, MO), 4461 (MBM, MO; $n = 22$), 4462, 4463, 4464, 4465 (MBM, MO); *Brade* 19494 (RB); *Frenzel in* 28 Feb. 1951 (MBM #6372, MBM #75197); *Hatschbach* 7541 (MBM); *Hatschbach & Oliveira* 42962 (MBM); *Hatschbach et al.* 42960, 42964 (MBM); *Kummrow* 1512, 2217 (MBM); *Pereira* 5193 (F, HB, MB, MO, RB); Sprea, Mun. Balsa Nova, *Hatschbach* 42966 (MBM); Campinhos, Mun. Bocaiúva do Sul, *Hatschbach* 1817 (MBM, PACA); Campina dos Tavares, Mun. Bocaiúva do

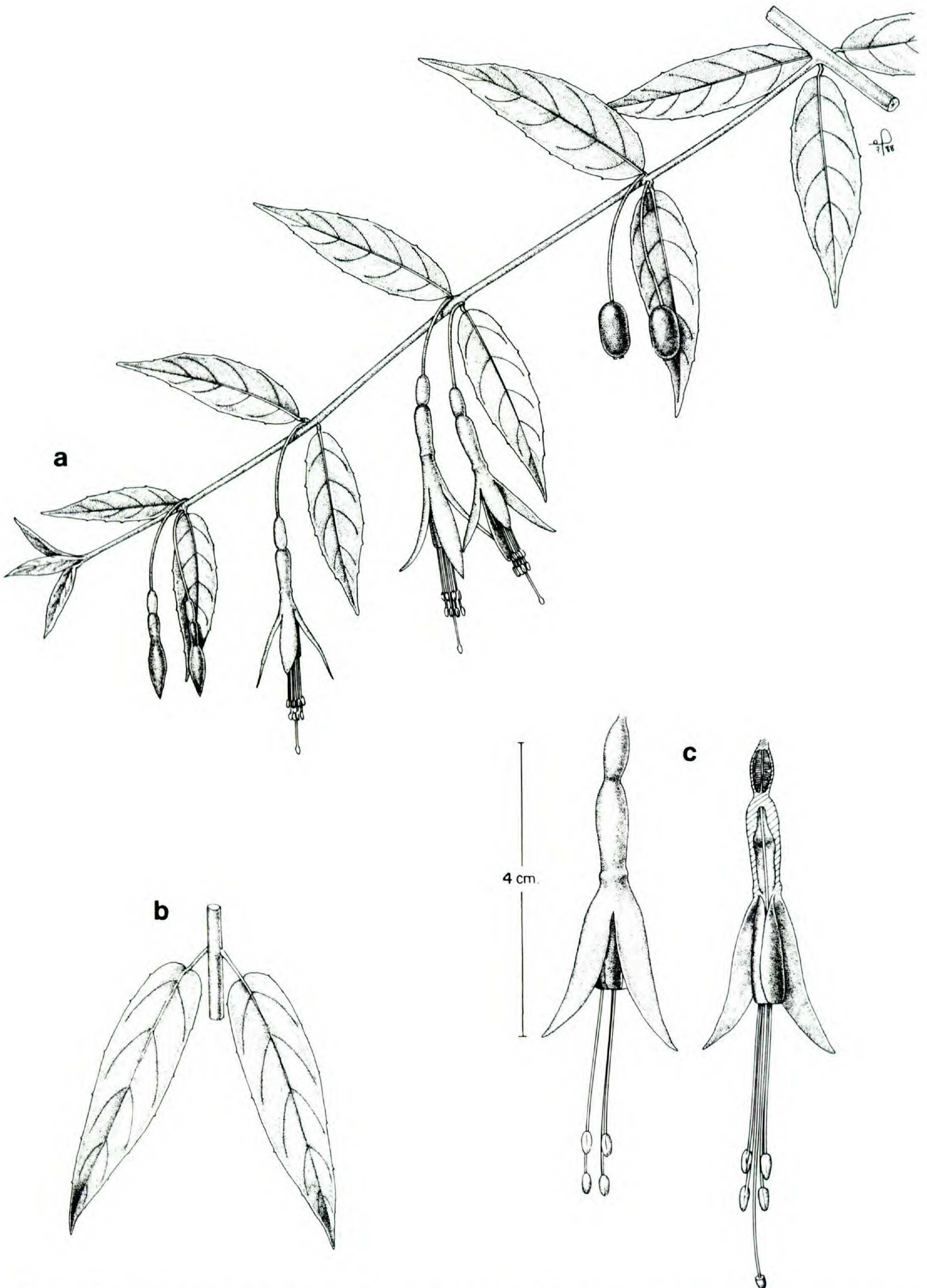


FIGURE 12. *Fuchsia hatschbachii*.—a. Flowering branch.—b. Details of leaves (upper surface).—c. Flowers. From *Berry et al.* 4458.

Sul, *Hatschbach* 7776 (MBM): Bacaetava, near cave, Mun. Bocaiúva do Sul, *Kummrow* 1022, 1418 (MBM), *Kummrow et al.* 2998 (MBM; $n = 22$); Bateias, Mun. Campo Largo, *Hatschbach* 40746 (MBM); Tigre, Mun. Cerro Azul, *Hatschbach* 43632 (MBM); Colombo, *Falkenberg* 2215 (FLOR); Manancial da Serra, *Braga* 550 (RB, SP); Açungui, *Mattos & Labouriau in 1 Mar. 1948* (RB); Paredão, Mun. Jaguariáiva, *Hatschbach* 31130 (MBM); Capão da Índia, *Hatschbach & Ramamoorthy* 42972 (MBM, MO); Serra das Almas, Mun. Palmeira, *Hatschbach* 13503 (MBM); Faz. Santa Rita, Mun. Palmeira, *Kummrow* 2217 (MBM); *Landrum* 3933 (MO); *Oliveira* 299 (MBM); Curiola, Mun. Rio Branco do Sul, *Hatschbach* 16155 (MBM); Madre, Mun. Rio Branco do Sul, *Hatschbach* 7774 (MBM); Serra do Caete, *Hatschbach* 40698 (MBM); Mun. Palmeira, BR-277, Rio Pagaio, *Hatschbach* 50824 (MBM).

Fuchsia hatschbachii is most likely to be confused with *F. regia* but differs by having shorter petioles, narrow leaves with somewhat curved petioles, shortly connate sepals, and small stipules. It is tetraploid, whereas all examined populations of *F. regia* from Paraná are octoploid. *Fuchsia hatschbachii* grows within 20 km of populations of *F. regia* subsp. *serrae* and *F. brevilibis* but occurs in drier, more interior areas of the planalto and is unusual in its close association with limestone or sometimes sandstone outcrops. The species is dedicated to Gert Hatschbach, Director of the Museu Botânico Municipal de Curitiba, who has done more than any previous botanist to collect and study the flora of Paraná.

8. *Fuchsia magellanica* Lamarck, *Encycl.* 2: 565. 1788; *Tabl. encycl.* 1, Volume 2(1): pl. 282. 1792. *Fuchsia magellanica* var. *typica* Munz, *Proc. Calif. Acad. Sci.* IV. 25: 9. 1943. *Fuchsia coccinea* Dryander var. *robustior* Hooker, *Bot. Antarc. Voy.*: 269. 1847, pro parte. TYPE: Chile. Straits of Magellan, Jan. 1768, *Philibert Commerson* (holotype, P—Lamarck Herbarium, also on microfiche; isotypes, BM, P—Jussieu Herb., LINN). Figure 13.

Fuchsia macrostema Ruiz & Pavón, *Fl. Peruv. Chil.* 3: 88, pl. 324, fig. b. 1802. *Fuchsia macrostema* Ruiz & Pavón var. *grandiflora* Hooker, *Bot. Misc.* 3: 308. 1833. *Fuchsia gracilis* var. *macrostema* (Ruiz & Pavón) Lindley, *Bot. Reg.* 13: pl. 1052, 1827. *Fuchsia coccinea* Dryander var. *macrostema* (Ruiz & Pavón) Hooker, *Bot. Antarc. Voy.*: 270. 1847. *Fuchsia magellanica* var. *macrostema* (Ruiz & Pavón) Munz, *Proc. Calif. Acad. Sci.* IV. 25: 9. 1943. TYPE: Chile: VIII Región (Bío-Bío), Concepción, Quebrada de Carcamo, 1778–1788, *Hipólito Ruiz & José Pavón* (lectotype, MA, here designated).

Thilcum tinctorium Molina, *Saggio Chili*, 2nd edition: 146, 286. 1810. LECTOTYPE: plate 47 of *Thilco* Feuillée in *J. Observ. Phys. Math. Bot.* (Hist. Plantes

Medicinales). 1725 here designated. (Feuillée described *Thilco* with five-merous flowers, which Molina thought worthy of generic recognition.)

Fuchsia gracilis Lindley, *Bot. Reg.* 10: pl. 847. 1824. *Fuchsia magellanica* var. *gracilis* (Lindley) Bailey, *Cyclop. Amer. Hort.*, 614. 1900. TYPE: cultivated in Walton, England, *John Lindley in 1824* (holotype, CGE). First illustrated in *Bot. Mag.* 2507. 1824, where it was erroneously identified by Graham as *Fuchsia decussata* Ruiz & Pavón.

Fuchsia conica Lindley, *Bot. Reg.*, t. 1062. 1827. *Fuchsia macrostemma* var. *conica* (Lindley) Sweet, *Brit. Fl. Gard.* 6: pl. 216. 1833. *Fuchsia magellanica* var. *conica* (Lindley) Bailey, *Cyclop. Amer. Hort.*, 614. 1900. TYPE: cultivated in London, England in 1826, from seeds sent from Chile in 1824, *John Lindley* (not seen).

Fuchsia gracilis var. *multiflora* Lindley, *Bot. Reg.* 13: pl. 1052. 1827. TYPE: cultivated at the Horticultural Society, London, England, 1826, from Chilean seeds introduced in 1824, *John Lindley s.n.* (holotype, CGE; isotype, K).

Fuchsia discolor Lindley, *Bot. Reg.*, pl. 1805. 1835. *Fuchsia magellanica* var. *discolor* (Lindley) Bailey, *Cyclop. Amer. Hort.*, 614. 1900. TYPE: cultivated at the Horticultural Society, London, England, from plants growing in Port Famine in the Magellan Straits, *John Lindley s.n.* (holotype, CGE).

Fuchsia chonotica R. A. Philippi, *Linnaea* 28: 687. 1856. *Fuchsia coccinea* Solander var. *chonotica* (R. A. Philippi) Reiche, *Anales Univ. Chile* 98: 485. 1897. TYPE: Chile: X Región (Los Lagos), Chiloé, Archipiélago de Huaytecas, 6 Mar. 1857, *F. Fonk 153a* (lectotype, SGO #53136, here designated). The lectotype is mounted on the same sheet with *Fonk 153b*, collected on 8-III-1857 from Puerto Low, Chiloé.

Fuchsia araucana F. Philippi in R. A. Philippi, *Bot. Zeit.* 34: 577, t. 9, fig. 6. 1876. TYPE: Chile: IX Región (Araucanía), Prov. Cautín, Tolén, Feb. 1875, *F. Philippi s.n.* (holotype, SGO #53139).

Fuchsia magellanica var. *molinae* Espinosa, *Bol. Mus. Nac. Chile* 12: 102. 1929. TYPE: Chile, X Región (Los Lagos), Chiloé, quebrada de La Chacra, near Castro, 31 Jan. 1929, *Espinosa s.n.* (holotype, SGO #53152; isotype, SGO #53121).

Fuchsia magellanica var. *eburnea* Pisano, *Ans. Inst. Pat. (Chile)* 10: 155. 1979. TYPE: Chile: XII Región (Magallanes), Isla Englefield, Seno Otway, 53°05'S, 71°51'W, 26 Feb. 1979, *Edmundo Pisano & R. Cárdenas 4947* (holotype, HIP #6892; isotypes, MO, RNG, SGO #95030).

Erect to semiscandent shrubs 0.5–3(–5) m tall. Branchlets tan to reddish, glabrous or occasionally sparsely strigillose with appressed hairs 0.3–0.4 mm long; older stems with tan, flaky bark, up to 25 cm diam. at the base. Leaves opposite, ternate or occasionally quaternate, membranous, (narrowly) elliptic-ovate, 15–55(–70) mm long, 5–25(–40) mm wide, acute to acuminate at the apex, mostly obtuse at the base, glabrous to strigillose along veins on both sides, paler below and sometimes with reddish veins; margin serrulate or crenate-dentate,

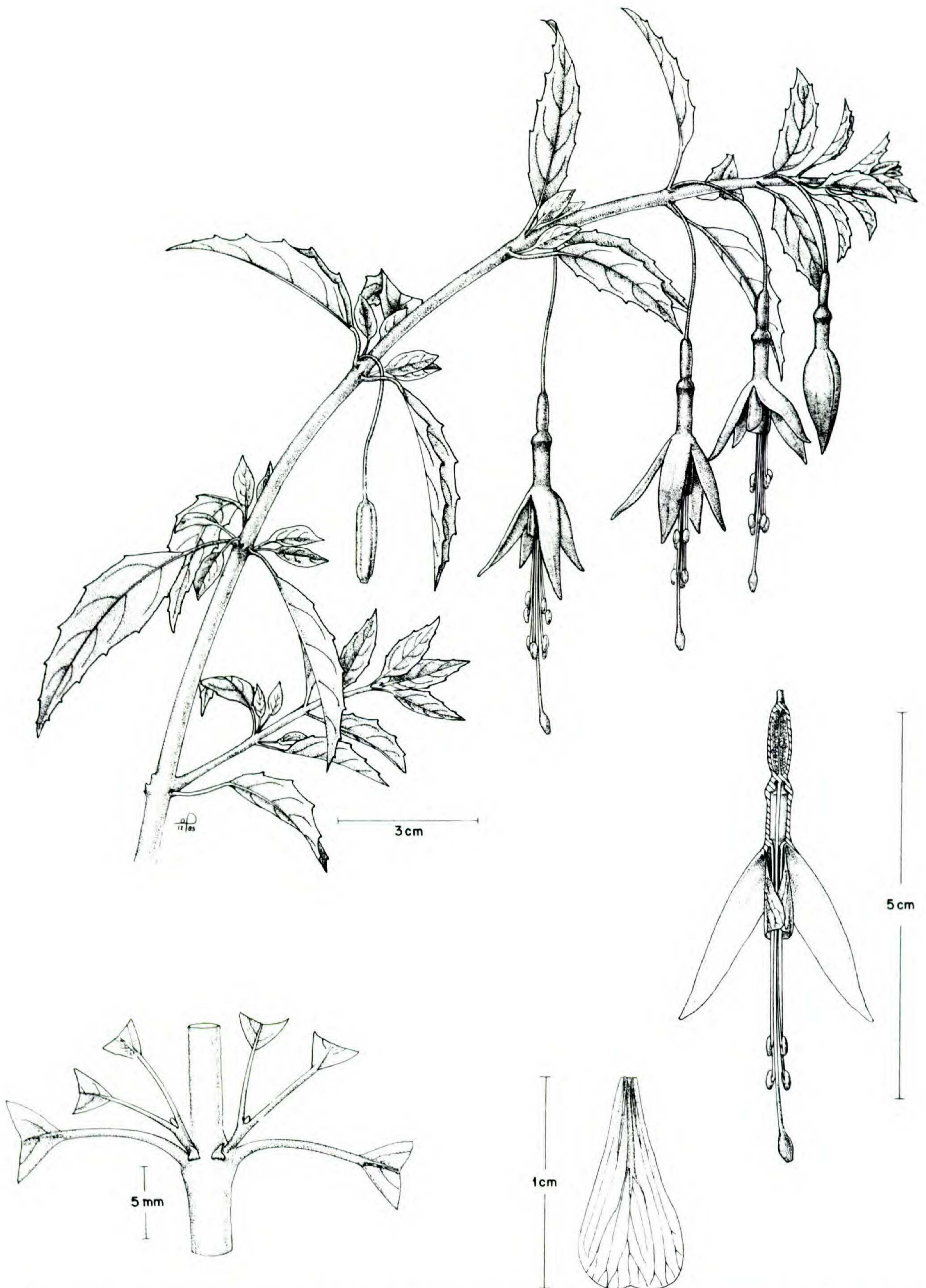


FIGURE 13. *Fuchsia magellanica*. Flowering branch, longitudinally split flower, individual petal spread open, and detail of stem with stipules and petioles. From Solomon & Solomon 4599.

veins; margin serrulate or crenate-dentate, often shallowly lobed between the teeth, secondary veins 4–7 per side. Petioles slender, 0.3–1 mm thick, 3–20 mm long. Stipules (narrowly) lanceolate, 0.7–

1.3 mm long, 0.5–0.8 mm wide, deciduous. Flowers solitary or rarely in pairs in upper leaf axils; pedicels filiform, pendulous, (13–)20–55 mm long, glabrous to strigillose. Ovary (narrowly) oblong,

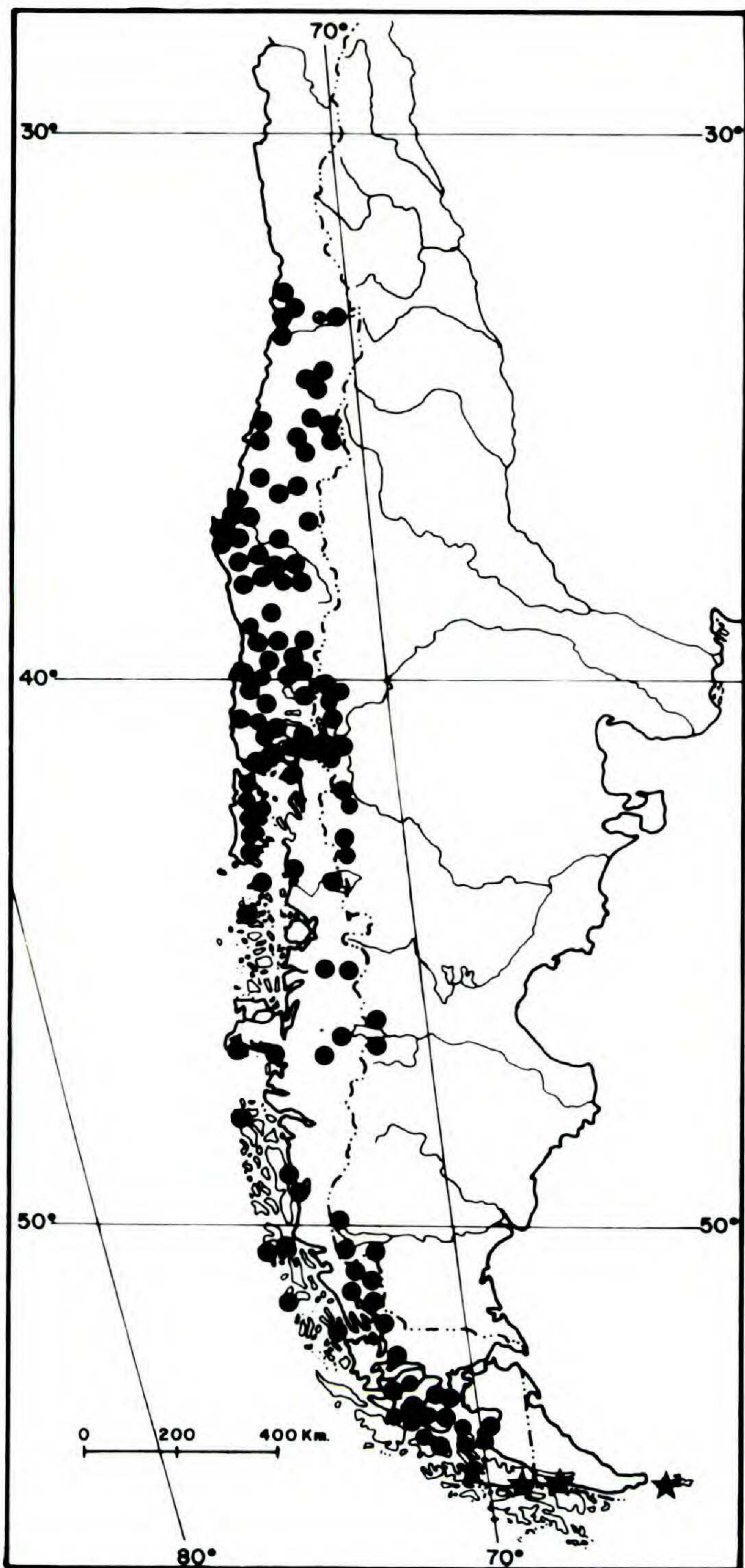


FIGURE 14. Native distribution of *Fuchsia magellanica*. Stars indicate collections made in the early 19th century from populations that have since been eliminated.

(5-)7-11(-14) mm long, 2-3 mm wide. Floral tube cylindrical to narrowly obconic, 7-15 mm long, 2-3.5 mm wide, glabrous to strigillose outside, pilulose inside; nectary 1.8-3 mm high, irregularly lobed. Sepals (15-)17-25(-30) mm long, narrowly lanceolate, connate at the base for 2-5 mm; free lobes (3-)4.5-7(-8) mm wide at base, acuminate at the apex, spreading at anthesis. Tube and sepals generally crimson, rarely pale whitish pink. Petals purple or rarely pale pink, narrowly obovate, (8-)11-20 mm long, 5-11 mm wide, apex rounded. Filaments red-purple, (18-)22-35 mm and (11-)19-31 mm long; anthers purplish,

oblong, 2.5-3.5 mm long, 1-2 mm wide. Style purple-red, pubescent at the base; stigma clavate, purple-red, 2-3 mm long, 1-2 mm wide. Berry narrowly oblong, (10-)15-22 mm long, 4-7 mm thick; seeds irregularly oblong-triangular, 1.0-1.4 mm long, 0.7-0.9 mm wide. Gametic chromosome number $n = 22$.

Distribution (Fig. 14). In moist scrub and along forest margins or in clearings, usually near water. Throughout the central and southern Andes of Chile and Argentina and in coastal Chile; from Valparaíso, Chile (32°50'S) and Neuquén, Argentina (39°30'S) to southern Tierra del Fuego (55°S). From sea level (throughout the range) to 1,750 m in central Chile near Santiago. Flowering principally from December to March, occasionally as early as October and as late as April. Widely cultivated throughout the world and naturalized in parts of South America, east Africa, New Zealand, Ireland, and Hawaii.

Representative specimens examined. CHILE. V REGION (VALPARAÍSO). VALPARAÍSO: Viña del Mar, road to Concón, 23 Apr. 1939, *Behn* s.n. (NY); Concón, 14 Jan. 1950, *Boelcke* 3920 (BAA, MO, SI); *Poeppig* 124 (BM, MO, P); Valparaíso, 7 Dec. 1930, *Behn* s.n. (MO, UC); Oct. 1829, *Bertero* 1008 (F, G, GH, MO); 1832, *Bridges* 198 (LE, W), s.n. (G, K, W); *McRae in Feb. 1825* (LE); Las Docas, 26 Dec. 1949, *Boelcke* 3838 (BAA, SI); Cerro Campana, Cajón Grande, Pozo de Coipo, 8 Oct. 1955, *Garaventa* 6606 (CONC); Limache, Cajón Grande, 27 Dec. 1944, *Boelcke* 427 (BAA); Curauma, 31 Jan. 1932, *Garaventa* s.n. (CONC); Fundo Pajonal, Valparaíso, 10 Oct. 1955, *Skottsberg* s.n. (S); N slope, Laguna Verde, 15 km S of Valparaíso, 29 Nov. 1935, *West* 3980 (MO, UC). SAN ANTONIO: Playa Mirasol, ca. 36 km N of San Antonio, 1 Mar. 1982, *Landrum* 4338 (NY). REGION METROPOLITANA (SANTIAGO): SANTIAGO: Peñalolen, Casa de Piedra, 1,500 m, 2 Jan. 1927, *Looser* 148-H (SI); Quebrada Peñalolen, E of Santiago, 33°29'S, 70°32'W, 1,600 m, 22 Feb. 1928, *Looser* 2299 (POM), 28 Feb. 1928, 2300 (POM), 30 Dec. 1929, *Garaventa* 828 (POM); Santiago, "ad rivulos frequens," *Gay* 1234 (SGO); Santiago, 22 Sep. 1918, *Claude-Joseph* 531 (NY, US). VI REGION (O'HIGGINS). CACHAPOAL: Montaña La Leona, 1828, *Bertero* 280 (F, G, GH, LE, MO, NY, P, SGO, W); Rancagua, 1829, *Bertero* 280 (F, GH, NY, P); San Vicente, 1925, *Pennell* 12866 (SGO). COLCHAGUA: Talcahue, 34°36'S, 70°53'W, 1870, without collector (SGO #41427); Ciruelos, Dep. de San Fernando, 15 Nov. 1943, *Aravena* 38 (SGO); Hacienda Millahue de Apalta, 34°36'S, 71°16'W, 16 Feb. 1946, *Kausel* 1821 (SGO). VII REGION (MAULE). CURICO: road Curicó to Argentina, beyond Los Queñes, along Arroyo Puerta, Andean foothills at 1,240 m, 13 Feb. 1936, *Mexia* 7863 (BH, BM, F, G, GH, MO, NA, NY, S, U, UC, US); 19 km E of Los Queñes, 9 Mar. 1967, *Martcorena & Matthei* 800 (BAB, CONC); Cordillera Peteroa-Planchón, Cañon Rio Claro, 950 m, 18 Feb. 1936, *Mexia* 4406 (GH, MO, UC); Húmeda Puntilla, Norte Llico, 2 Feb. 1969, *Villagrán & Tapia* s.n. (SGO); Fundo La Morita, 20 Dec. 1968, *Mahu* 2787 (BAB); Aquelame, near Laguna Vi-

- chuquén, 16 Sep. 1963, *Barra s.n.* (CONC #28414); Vichuquén, Dec. 1861, without collector (SGO #53132). TALCA: Constitución, Feb. 1891, *Reiche s.n.* (SGO #60893). LINARES: La Mina, road to Melado, 17 Dec. 1953, *Ricardi 2793* (CONC); Quinamavida, 35°47'S, 71°26'W, 1912, *Husbando 840* (NA). VIII REGION (BÍO-BÍO). ÑUBLE: Termas de Chillán, 24 Dec. 1907, *Elwes s.n.* (K); Baños de Chillán, 1,400–1,500 m, 29–31 Jan. 1925, *Pennell 12473* (F, PH, SGO, US); *Reed s.n.* (K); Las Trancas, road to Chillán, 28 Feb. 1979, *Rodríguez 1107* (CONC); 25 km above Recinto, road to Termas de Chillán, 1,500 m, 17 Jan. 1979, *Solomon 4389* (MO); Guarilhue, 36°33'S, 72°41'W, 21 Feb. 1977, *Quezada 203* (CONC); Yungay, Fundo Baquedano–Sta. Lucía, 4–9 Feb. 1957, *Artigas 19587* (CONC). CONCEPCIÓN: Coronel, 1865, *Ochsenius s.n.* (MO); Río Chivilingo, 4 km S of Coronel, 5 Jan. 1966, *Meyer 9777* (K, MO, NA, UC); *Walker 240* (GH, US); Puente La Araucana at Gualqui, 37°00'S, 72°55'W, 21 Jan. 1979, *Solomon 4418* (MO); 8 km E of San Rafael–Coelemu road, on road to San Ignacio, 300 m, 19 Jan. 1979, *Solomon 4397* (MO); hills back of Talcahuano, 22 Feb. 1917, *Skottsberg 1454* (NY, S); mouth of Río Bío-Bío, 20 Dec. 1950, *Ricardi 11359* (CONC), 17 Oct. 1953, *Sparre 9989* (CONC); 5 km SE of Concepción along Río Bío-Bío, 200 m, 17 Feb. 1967, *Skog 1033* (POM, US); Talcahuano, Parque Hualpén, 13 Dec. 1950, *Ricardi 11178* (CONC), 7 Jan. 1976, *Martcorena et al. 1814* (CONC), 6 Nov. 1969, *Carrasco 200* (CONC); 16 Sep. 1896, *Dusén s.n.* (S); Hualqui, Picacho, 13 Jan. 1937, *Junge 5934* (CONC); 1 km S of Ramuncho, base of W-facing coastal cliffs, W of Talcahuano, Punta Hualpén Peninsula, 31 Dec. 1951, *Hutchison 226* (K, UC, US); Talcahuano and Concepción, *Née? s.n.* (MA #183584); Isla Quiriquina, 15 Sep. 1942, *Junge 6879* (CONC); Quebrada Honda, Puentes Mellizos, 21 Apr. 1976, *Martcorena et al. 1075* (CONC); San Vicente, above beach, 3 Mar. 1925, *Pennell 12866* (GH, PH); Fundo Trinitarias, 29 Dec. 1934, *Pfister 1232* (CONC); Cerro Caracol, 14 Nov. 1937, *Pfister 6477* (CONC); Concepción, Predio Universitario, 26 Oct. 1950, *Ricardi s.n.* (CONC); Barrio Universitario, 13 Mar. 1980, *Riquelme s.n.* (MO; 2n = 44); Las Canoas, road Concepción to Chaimávida, 12 Feb. 1980, *Riquelme s.n.* (MO; 2n = 44); Concepción, 1855, *Germain s.n.* (BM, F, G); 1826–1830, *King & Andersson s.n.* (BM); Oct. 1825, *Macrae s.n.* (BR, G, K); *Née s.n.* (MA #183583). BÍO-BÍO: 4 km above dam on road to Laguna La Laja, 930 m, 23 Jan. 1979, *Solomon 4440* (MO); Antuco, *Reynolds s.n.* (GH); Cordillera Antuco, La Cueva, Feb. 1887, *Rahmer s.n.* (SGO); Laja, Salto del Trubunleo, 23 Jan. 1969, *Boelcke 6528* (BAA), 90359 (BAB); 23 Jan. 1969, *Ricardi & Martcorena 5802* (CONC); road from Bío-Bío to Copahue, 4 km E of Pitrillón, 13 Mar. 1976, *Martcorena et al. 990* (CONC); road Santa Bárbara to Río Huecucura, 12 Mar. 1976, *Martcorena et al. 889* (CONC); road from Bío-Bío to Copahue, 3 km past Bío-Bío, 13 Mar. 1976, *Martcorena et al. 920* (CONC); road Bío-Bío to Santa Bárbara, 14 Mar. 1976, *Martcorena et al. 1010* (CONC). ARAUCO: Cordillera de Nahuelbuta, Contulmo tunnel, La Huina, 19 Feb. 1955, *Aravena 29* (BR, SI, UC); El Diamante, Cordillera de Nahuelbuta, 14 Mar. 1978, *Quezada 230* (CONC); Estación Lanalhue, 20 Feb. 1955, *Aravena 35* (UC); Laraquete, 37°10'S, 73°15'W, 20 m, 21 Jan. 1979, *Solomon 4413* (MO); Quebrada del Río Trongol, 13 Dec. 1974, *Rodríguez 634* (CONC); road Curanilahue to Cañete, 11 Jan. 1972, *Quezada et al. 18* (CONC); Trongol Bajo, 3 Mar. 1978, *Cuevas 3* (CONC); Isla La Mocha, Jan. 1959, *Behn 25364* (CONC); *Eights s.n.* (US); Fundo Sta. Sofía de Raqui, *Ricardi 9173* (CONC); cliffs on E side of Río Tubul, 20 Jan. 1979, *Solomon 4408* (MO). IX REGION (ARAUCANIA). MALLECO: Fundo Solano, Los Alpes, Cordillera de Nahuelbuta, 590 m, 12 Jan. 1958, *Eyerdam 10141* (NY, SGO, UC, US); Angol, 15 Nov. 1933, without collector (UC); 10 Feb. 1892, *Kuntze s.n.* (F); road Vegas Blancas–Angol, 22 Mar. 1973, *Rodríguez & Torres 155* (CONC); Ercilla, Feb. 1892, *Kuntze s.n.* (F, NY); between Manzanar & Malacahuello, 7 Jan. 1977, *Martcorena et al. 1226* (CONC); cuesta La Esperanza, 200 m, 3 Mar. 1980, *Martcorena & Quezada 1669* (CONC); Parque Nacional Nahuelbuta, 9 Jan. 1968, *Ricardi et al. 1969* (BAB, CONC); Collipulli to Curaco, 3 km before Curaco, 340 m, 3 Mar. 1980, *Martcorena & Quezada 1670* (CONC); Termas de Tolhuaca, 1,140–1,180 m, *Morrison & Wagenknecht 17499* (BH, F, G, GH, MO, NA, S, UC); Volcán de Tolhuaca, 1,300–1,400 m, 24 Feb. 1925, *Pennell 12787* (PH); Reserva Forestal Malleco, Los Guindos, 38°03'S, 71°47'W, 7 Apr. 1978, *Rodríguez 128* (CONC); Río Blanco, 27 Dec. 1952, *Schwabe 13733* (CONC); 3 km below Vegas Blancas, 37°45'S, 72°58'W, 24 Jan. 1979, *Solomon 4469* (MO); Termas del Río Blanco, 2 Jan. 1948, *Pfister 7895* (CONC); Traiguén, Quecheregua, 600 m, 1 Dec. 1947, *Sparre 3327* (S); Pailahueque, Dec. 1929, *Pirión 201* (GH); Renaico Valley, 15 Jan. 1902, *Elwes s.n.* (K). CAUTÍN: Pucón, near Villarrica, 250 m, Jan. 1929, *Buchtien s.n.* (MO); Feb. 1935, *Pfister 1979* (CONC); Villarrica, Fundo Flor del Lago, 1 Jan. 1946, *Behn 26906* (CONC); Volcán Villarrica, 23 Apr. 1952, *Frödin 819* (BM); 3 km E of Puente Correntoso, 17 km E of Villarrica, 39°16'S, 72°00'W, 30 Jan. 1979, *Solomon 4535* (MO); Laguna Conguillío, Feb. 1963, *Gleisner 194* (CONC); 3 km from Laguna Captrén, Temuco, 20 Jan. 1976, *Martcorena et al. 830* (CONC); between Laguna Quililo and Melipeuco, 12 Jan. 1977, *Martcorena et al. 1475* (CONC); Lastarria, 39°13'S, 72°41'W, 3 Mar. 1980, *Martcorena & Quezada 1712* (MO; 2n = 44); S of Lautaro, banks of Río Cautín, 7 Mar. 1980, *Martcorena & Quezada 1713* (MO; 2n = 44); Río Cautín, Nov. 1919, *Hollermeyer s.n.* (G); Depto. Victoria, 12 Mar. 1939, *Morrison & Wagenknecht 17499* (K); Lago Caburgua, 6 Feb. 1969, *Navas 3419* (B); Toltén, Feb. 1875, *Philippi s.n.* (SGO #53139, SGO #41419); Termas de Palguín, 11 Jan. 1953, *Ricardi 2399* (CONC); Volcán Llaima, Parque Nac. Los Paraguas, 29 Jan. 1979, *Solomon 4511* (MO); entrance to Parque Nac. Villarrica, 30 Jan. 1979, *Solomon 4523* (MO); road to Curarrehue, 9 km E of Lago Caburga road, 30 Jan. 1979, *Solomon 4534* (MO); Cerro Nielol, 20 Nov. 1947, *Sparre 3209* (S); Río Imperial, Carahue, 4–5 Dec. 1947, *Sparre 3380* (S); Curilafquén, Río Allipén, 10 Dec. 1947, *Sparre 3509* (S); Puerto Saavedra, 18 Jan. 1951, *Garaventa 6333* (CONC); Cautín, 1914, *Calvert s.n.* (BAA). X REGION (LOS LAGOS). VALDIVIA: Calafquén, 21 Jan. 1927, *Comber 1031* (K); Depto. Panguipulli, 39°34'S, 72°04'W, 15 Jan. 1976, *Martcorena et al. 439* (CONC); Panguipulli, Mar. 1927, *Hollermayer 1364* (A, BM, CAS, F, G, GH, K, MO, NY, S, UC, US, Z); Pampa Pirihuín, Panguipulli, 17 Jan. 1976, *Martcorena et al. 609* (CONC); Purulón, 39°28'S, 72°41'W, 12 Jan. 1976 (CONC); Lago Riñihue, ribera Norte, Llascahue Chico, *Martcorena et al. 253* (CONC); desague del Lago Riñihue, 13 Jan. 1976, *Martcorena et al. 288* (CONC); Paso Carriñe, Panguipulli, 18 Jan. 1976, *Martcorena*

et al. 646 (CONC); road to Choshuenco, Panguipulli, 16 Jan. 1976, *Martcorena et al.* 536 (CONC); Coñaripe-Liquiñe road, 16 km E of Panguipulli road, 31 Jan. 1978, *Solomon* 4544 (MO); road to camino del los Ríos Blanco and Rañintulelfu, 39°46'S, 71°45'W, 18 Jan. 1976, *Martcorena et al.* 661 (CONC); W slopes of Cordillera Pelada, 9 km W of El Mirador on La Unión-Punta Hueicolla road, 18 Feb. 1976, *Crosby* 12757 (MO); Bima district, W of La Unión, Cordillera de Alerce, 10 Feb. 1938, *Eyerdam* 10669 (F, NY, UC, US); La Unión, Cerro Esmeralda, Feb. 1958, *Schlegel* 1525 (CONC); Calle-Calle, 30 Oct. 1896, *Buchtien s.n.* (BREM, CGE, F, G, GH, OXF, S, US, WU, Z); La Unión, Llanacacura, 22-24 Dec. 1947, *Sparre* 3612 (S); Quinchirica, 1 Mar. 1942, *Hollermayer* 7 (UC); Curiñanco, 7 Mar. 1948, *Sparre* 4683 (S); Niebla, 2 Nov. 1957, *Santos s.n.* (VALD); estero Puente Negro, 39°58'S, 73°05'W, *Martcorena & Quezada* 1671 (MO; 2n = 44); 2 km from Enco, 17 Jan. 1976, *Martcorena et al.* 585 (CONC); S of Valdivia, 2 km past road to Los Guindos, 39°40'S, 73°02'W, *Martcorena & Quezada* 1672 (MO; 2n = 44); Rio Cruces, S of Lanco, 7 Mar. 1980, *Martcorena & Quezada* 1711 (MO; 2n = 44); 1 km SE of Puente Piedra Blanca, 8 km S of Valdivia, 29 Jan. 1979, *Solomon* 4550 (MO); Trumao, Valdivia, Feb. 1865, *Philippi* 633a (SGO); Amargo, Valdivia, 18 Nov. 1956, *Schmitz* 108 (VALD); Valdivia, 3 Nov. 1850, *Lechler* 537 (CGE, G, O); Feb. 1852, *Philippi* 35 (BM, CGE, G, O, P, S, TCD); Corral, Mar. 1938, *Pérez Moreau s.n.* (RSA), 12 Oct. 1929, *Gunckel* 2 (BM, F), 3 Oct. 1930; Corral-La Aguada, 8 Dec. 1934, *Gunckel* 3052 (CONC); Isla Manzeras, Corral, in the fort, 20 Sep. 1932, *Junge* 2498 (CONC); Corral, near San Carlos, 31 Oct. 1932, *Junge* 2525 (CONC); Arrigua, Nov. 1854, *Lechler s.n.* (GH); Cerro Llifén, 40°11'S, 72°15'W, 23 Feb. 1958, *Furet* 55 (CONC). OSORNO: Puyehue, 15 Jan. 1947, *Wall s.n.* (S); Dec. 1939, *Sandeman* 396 (OXF); 12 km above Aguas Calientes, Parque Nacional Puyehue, 4 Feb. 1979, *Solomon* 4587 (MO); N shore Lago Llanquihue, 3 Dec. 1948, *Senn* 4632 (GH, MO, RSA, US); Portezuelo Desolación, Volcán Osorno, *Rudolph* 4713 (VALD); La Picada, Volcán Osorno, *Sparre s.n.* (S); Golgol, 40°34'S, 71°56'W, 6 Mar. 1948, *Rudolph* 4726 (VALD); Pampa Alegre, sea shore, 14 Jan. 1948, *Sparre* 3967 (S); Tres Esteros, 40°41'S, 72°53'W, 15 Dec. 1940, *Rudolph* 4724 (VALD); Hueyusca, 40°55'S, 73°38'W, 16 Feb. 1950, *Rudolph* 4711 (VALD); San Juan de la Costa, 40°31'S, 73°24'W, 10 Feb. 1950, *Rudolph* 4710 (VALD); Osorno, 15 Jan. 1885, *Philipp & Borchers s.n.* (BM); Osorno, S of Puente Rahue, 40°41'S, 73°08'W, 4 Mar. 1980, *Martcorena & Quezada* 1676 (MO; 2n = 44); 10 mi. E of ocean, road to Termas Pucatrihue and Osorno, 29 Jan. 1958, *Eyerdam* 10532 (F, NY, UC, US). LLANQUIHUE: Lago Llanquihue, 6 Mar. 1897, *Dusén s.n.* (G, O); Jan. 1909, *Hicken s.n.* (G); Llanquihue, Isla Loreley, 1913, *Hosseus* 45 (CORD); Frutillar Bajo, shore of Lago Llanquihue, 4 Mar. 1980, *Martcorena & Quezada* 1677 (MO; 2n = 44); between Frutillar Bajo and Frutillar Alto, 4 Mar. 1980, *Martcorena & Quezada* 1678 (MO; 2n = 44); Ensenada, Lago Llanquihue, 8 Feb. 1939, *Eyerdam & Beetle* 24621 (K); 2 km N of Llanquihue, 4 Mar. 1980, *Martcorena & Quezada* 1679 (MO; 2n = 44); Los Riscos, near Lago Llanquihue, 26 Feb. 1967, *Skog* 1078 (POM, US); Santa Ida, between Puerto Varas and Ensenada, Lago Llanquihue, 6 Mar. 1980, *Martcorena & Quezada* 1706 (CONC; 2n = 44), 1707 (CONC; 2n = 44); Puerto Varas, *Hicken* 87 (SI);

Llanquihue, 6 Feb. 1972, *Cantino* 7 (GH); Parque Nacional Pérez Rosales, 41°09'S, 72°18'W, 8 Dec. 1971, *Martcorena et al.* 1926 (CONC); Saltos del Río Petrohue, Parque Nac. Vicente Pérez Rosales, 6 Mar. 1980, *Martcorena & Quezada* 1708 (MO; 2n = 44); Puerto Varas, Punta Guano, 41°09'S, 72°18'W, 20 Sep. 1971, *Weldt* 1248 (CONC); Puerto Varas, 4 Feb. 1945, *Hosseus* 192 (CORD); Piedra Azul, 11 Feb. 1967, *Ricardi* 5287 (CONC); foot of Cerro Hornohuico, E side of Chamiza-Lago road, 20 Jan. 1946, *Pfister* 6047 (CONC); Centinela, Jan. 1948, *Sparre* 4398 (S); Lago Chapo, 235 m, 41°26'S, 72°35'W, 6 Mar. 1980, *Martcorena & Quezada* 1704 (CONC; 2n = 44); between Correntoso and Lago Chapo, 6 Mar. 1980, *Martcorena & Quezada* 1703 (MO; 2n = 44); Chamiza, 41°29'S, 72°51'W, 6 Mar. 1980, *Martcorena & Quezada* 1699 (MO; 2n = 44); between Puerto Montt and Pargua, El Avellanal, 41°45'S, 73°24'W, 4 Mar. 1980, *Martcorena & Quezada* 1680, 1682 (MO; 2n = 44); Puerto Montt, 1912, *Geisse s.n.* (Z); Isla Tengo, Puerto Montt, 20 Mar. 1969, *Plowman* 2604 (GH, K, US); Peulla, 1922, *Weogelt s.n.* (G), 14 Feb. 1925, *Pennell* 12675 (F, GH, NY, PH); Volcán Osorno, 11 km from Ensenada-Yerbas Buenas road to ski slopes, 6 Feb. 1979, *Solomon* 4599 (MO); Ensenada, Volcán Osorno, 8 Feb. 1939, *Eyerdam & Beetle* 24621 (GH, NA, UC); Petrohué, shores of Lago Todos Los Santos, 6 Mar. 1980, *Martcorena & Quezada* 1709 (MO; 2n = 44); Lago Todos Los Santos, 7 Feb. 1939, *Eyerdam et al.* 24591 (BH, G, GH, K, MO, NA, UC); Casa Panque, between Nahuel Huapí and Laguna Todos Los Santos, Dec. 1926, *Edwards s.n.* (BM), 3 Jan. 1939, *Hunnewell* 16069 (GH); Nahuel Huapí, 29 Dec. 1929, *Stuckert s.n.* (CORD). CHILOE: 1.5 km from Chacao to Ancud, 4 Mar. 1980, *Martcorena & Quezada* 1683 (MO; 2n = 44), 10 Jan. 1975, *Martcorena et al.* 36 (CONC); near Ancud, 24-28 Jan. 1932, *Macmillan & Erlanson* 36 (US); Isla Buta Chagues, Golfo de Ancud, 42°17'S, 73°10'W, 17 Nov. 1968, *McFarland & Barrett* 35-14 (NA); Isla Chaullín, Golfo de Ancud, 43°03'S, 73°27'W, 18 Dec. 1965, *Schallenberger & Barrett* 36-9 (NA); between Paranguí and Curamo, road Chacao-Ancud, 4 Mar. 1980, *Martcorena & Quezada* 1684 (MO; 2n = 44); road Ancud-Castro, 14 Jan. 1975, *Martcorena et al.* 187 (CONC); road to Dalcahue, 42°20'S, 73°42'W, 5 Mar. 1980, *Martcorena & Quezada* 1696 (MO; 2n = 44); between Estero Mechaico and Río San Antonio, Ancud-Castro road, 5 Mar. 1980, *Martcorena & Quezada* 1698 (MO; 2n = 44); Castro, Tranque Río Gamba, 5 Feb. 1957, *Ricardi & Martcorena* 4020 (CONC); Castro-Chonchi road, 12 Feb. 1967, *Ricardi* 5290 (CONC); near Castro, 15 Mar. 1936, *Mexia* 8009 (BH, BM, F, G, K, MO, NY, S, UC, US); 4 km S of Castro to Quellón, 5 Mar. 1980, *Martcorena & Quezada* 1686 (MO; 2n = 44); Río Mollueco, Castro to Quellón, 5 Mar. 1980, *Martcorena & Quezada* 1692 (MO; 2n = 44); 3 km past Coinco Alto, Castro to Quellón, 43°01'S, 73°38'W, 5 Mar. 1980, *Martcorena & Quezada* 1693 (MO; 2n = 44); near Río Trañic, Castro to Quellón, 5 Mar. 1980, *Martcorena & Quezada* 1687 (MO); Lago Natri, E side, Castro to Quellón, 5 Mar. 1980, *Martcorena & Quezada* 1689 (MO; 2n = 44); 11 Jan. 1975, *Martcorena et al.* 55 (CONC); Quellón, Punta lapa en Ñadi, 12 Jan. 1975, *Martcorena & Quezada* 78 (CONC); Quellón, 5 Mar. 1980, *Martcorena & Quezada* 1694 (MO; 2n = 44); San Carlos, 8 Apr. 1872, *Blake s.n.* (GH); Cucao-Quilán, 1 Jan. 1932, *Junge* 1483 (CONC); Valle del Río Manao, 41°52'S, 73°32'W, 16 Mar. 1947,

- Rudolph 4714* (VALD); Piruquina-Ovejería, 6 Feb. 1932, *Junge 1777* (CONC); Isla Chiloé, 1871, *Reed 85* (BM, K), 1826–1830, *King (Andersson) s.n.* (BM, K, TCD); San Carlos de Chiloé, *Née s.n.* (MA). PALENA: Bahía Tictoc, Golfo Corcovado, 43°36'S, 72°54'W, 19 Nov. 1968, *Barrett 37-17* (NA); Rolecha, 41°55'S, 72°50'W, 5 Jan. 1951, *Pfister s.n.* (CONC); Mt. Leones, Río Palena, Nov. 1923, *Werdermann 61* (BM, CAS, F, G, GH, MO, SI, UC, Z); Puerto Low, 8 Mar. 1857, *Fonch 153G* (SGO). XI REGION (AISEN). AISEN: Islas Guaytecas, Melinka, 9 Feb. 1957, *Ricardi & Marticorena 4104* (CONC); Isla Johnson, 44°22'S, 74°19'W, 12 Nov. 1947, *Behn 65* (SGO); Puerto Aisén, 17 Feb. 1945, *Looser 5161* (US); road from Puerto Aisén to Coihaique, 13 Feb. 1943, *Maldonado 126* (F, GH, U); Puerto Barroso, Península Tres Montes, Golfo Tres Montes, 46°49'S, 75°16'W, 22 Nov. 1968, *Norris & Barrett 39-17* (NA); Golfo San Estéban, Fiordo Kelley, 46°55'S, 74°05'W, 28 Nov. 1972, *Hoppe 14* (RNG); Península Taitao, *Nordenskiöld in 17 Dec. 1920* (GOT). COIHAIQUE: Laguna Fenchik, 45°33'S, 71°47'W, 13 Feb. 1959, *Schlegel 2246* (CONC); Parque Nacional Río Simpson, Mar. 1968, *Sanguiesa s.n.* (SGO). GENERAL CARRERA: Valle León, región Lago Buenos Aires, 11 Feb. 1939, *von Rentzell 6223* (GH, MO); Lago General Carrera, Mina Silva, 46°30'S, 72°20'W, 18 Dec. 1939, *Heim s.n.* (Z); Valle del Río Soler, slopes of Cerro Piña, 47°00'S, 73°15'W, 22 Dec. 1971, *Davison F-40* (HIP). CAPITÁN PRAT: Puerto Santa Barbara, 48°04'S, 75°29'W, 1826–1830, *King s.n.* (TCD). XII REGION (MAGALLANES). ULTIMA ESPERANZA: Puerto Edén, 49°1'S, 74°28'W, 23 Jan. 1968, *Anliot 6143* (SGO); 21 Mar. 1868, *Cunningham s.n.* (K, LE); Puerto Grappler, Promontorio Exmouth, 49°25'S, 74°19'W, 6 Feb. 1879, *Ibar s.n.* (SGO); Ring Dove Inlet, 49°44'S, 74°10'W, 24 Jan. 1879, without collector (SGO #53127); Ultima Esperanza, *Gusinde 295* (GOT); Portland Bay, Midpoint Channel, 50°15'S, 74°44'W, Jan. 1956, *Tillman 55* (BM); Isla Drummond Hay, Puerto Molyneux, 50°15'S, 74°55'W, 11 Dec. 1977, *Roig 144* (HIP); Bahía Corbeta Papudo, 50°22'S, 75°19'W, 25 Nov. 1968, *Barrett et al. 42-7* (NA); Cordillera de Paine, 50°54'S, 73°00'W, Jan. 1966, *Tsujii 784* (CONC); Andean foothills, ca. 51°00'S, 72°50'W, 1961, *Anderson 18* (HIP); Cerro Castillo, Lago Toro, La Península, 51°19'S, 72°46'W, 15 Dec. 1975, *Boelcke et al. 565* (HIP, RNG); Puerto Balmaceda, Costa E Río Serrano, 51°19'S, 73°07'W, 25 Jan. 1977, *Pisano 1993* (HIP, RNG); Puerto Toro, Río Serrano, 51°24'S, 73°05'W, 17 Jan. 1977, *Moore & Pisano 1762* (HIP, RNG); Península W of mouth of Río Serrano, 23 Jan. 1977, *Moore & Pisano 1915* (HIP, RNG); Isla Diego de Almagro, 51°26'S, 75°04'W, 28 Mar. 1945, *Biese 1486* (SGO); Puerto Bellavista, 51°31'S, 73°16'W, 11 Jan. 1977, *Moore & Pisano 1628* (CONC, HIP, RNG); near Ultima Esperanza, 51°30'S, 73°00'W, *Borge 339* (GH, K, NY, S, US); Seno Ultima Esperanza, *Hicken 87* (SI); Isla Virtudes, Canal Elías, Puerto Virtudes, 51°33'S, 74°54'W, 9 Feb. 1976, *Dollenz et al. 1444* (HIP, RNG); Península Roca, Seno Resi, 51°51'S, 73°02'W, 24 Jan. 1978, *Pisano 2877* (HIP, RNG); Seno Unión, Ancón, 52°09'S, 73°02'W, 12 Jan. 1976, *Dollenz et al. 984* (HIP, RNG); Isla Long, 52°18'S, 73°38'W, 1 Feb. 1879, *Guero s.n.* (SGO); Smith Channel, Long Island, 1921, *Asplund 126* (S); Cueva del Milodón, 13 Jan. 1952, *Pfister & Ricardi 12065* (CONC); Eberhardt, 13 Apr. 1899, *Borge 344* (GH, MO, NY, S, US), *Donat 384* (BM, CAS, F, GH, K, MO, NY, Z). MAGALLANES: Isla Riesco, Mina Elena, 53°02'S, 72°45'W, 30 Apr. 1940, *Santesson 751* (K); Estancia Cerro Pinto, N side of Skyring Water, 16 Dec. 1968, *Goodall 1938* (NA, RNG); Skyring, 1 and 2 Feb. 1879, without collector (SGO #53128); Seno Otway, Punta Prat, *Seibert 2255* (M); Seno Otway, Punto Otway, 9 Feb. 1888, *Lee s.n.* (US); Río Caleta, Seno Otway, 53°09'S, 71°32'W, 5 Jan. 1979, *Cárdenas 17* (HIP, MO); Isla Engelfield, Seno Otway, 53°05'S, 71°51'W, 24 Feb. 1979, *Pisano & Cárdenas 4926* (HIP, MO, RNG, SGO); Seno Otway to Punta Arenas, 1 Mar. 1945, *Biese 1250* (F, GH); Fiordo Silva Palma, Angostura Titus, 53°26'S, 71°44'W, 9 Jan. 1973, *Pisano 3825* (HIP, MO, RNG); Borja Bay, Straits of Magellan, 53°32'S, 72°29'W, Feb. 1882, *Coppinger s.n.* (K); Ballena Cove, S point of Isla Carlos III, 53°35'S, 72°22'W, 18 May 1973, *Goodall 5* (NA); Península Brunswick, Bahía del Aguila, 53°47'S, 71°01'W, Nov. 1975, *Samsing s.n.* (HIP); Bahía del Indio, Lote San Isidro, Río Yumbel, 53°48'S, 71°00'W, 1 Mar. 1973, *Pisano 4024* (HIP, MO, RNG); Puerto San Antonio, 53°53'S, 70°54'W, 1826–1830, *Anderson et al. s.n.* (W), *King s.n.* (TCD); Fuerte Bulnes, 53°35'S, 70°56'W, 13 Mar. 1970, *Pisano 2501* (CONC, HIP, MO, NA), 25 Apr. 1951, *Pisano s.n.* (MO; 2n = 44); junction roads to Puerto Hambre and Fuerte Bulnes, 53°40'S, 70°55'W, 9 Mar. 1979, *Solomon & Solomon 4691* (HIP, MO); Puerto Edén, *Anliot 6143* (SGO); Port Gallant, 1838–1840, *Hombron s.n.* (P); 1838, *d'Urville s.n.* (TCD), 11 Feb. 1877, *Savatier 134* (K, P, RSA); Port Famine, 1826–1830, *King 75* (BM, CGE, K, TCD), 1834, *s.n.* (U, W); 1838–1840, *le Guillou 41* (P, TCD); Shipton Glacier, Bay of Mountains, 53°55'S, 72°01'W, 13 Feb. 1976, *Barclay 6* (US); Isla Dawson, 54°00'S, 70°45'W, 12 Mar. 1896, *Dusén s.n.* (P), 12 Mar. 1896, *Nordenskiöld 657* (O); Isla Dawson, Harris Bay, 25 Feb. 1908, *Skottsberg 174* (S); Islote Offing, Isla Dawson, *Pastore in 7 Feb. 1921* (SI #4842); Isla Capitán Aracena, Bahía Morris, 54°14'S, 71°01'W, 8–9 Dec. 1971, *Moore 2745* (BAB, NA, RNG); Magellan Straits, 1852, *Andersson 330* (MO), *Handisyd in July 1690* (BM, Sloane Herb.), 1826–1830, *King s.n.* (BM, F). TIERRA DEL FUEGO: Río Santa María, 60 km by Camino Sur, 53°43'S, 69°58'W, 10 Feb. 1972, *Pisano 3517* (HIP, MO); Canal Whiteside, Puerto Yartou, 53°50'S, 70°18'W, 12 Nov. 1941, *Santesson 1697* (K); S side of Bahía Inútil, 2 km E of Puerto Yartou, 53°52'S, 70°07'W, 13 Nov. 1971, *Moore 2439* (K, RNG); Bahía Inútil, 1905, *Crawshay s.n.* (BM); Isle Grawe, *Skottsberg 195* (W); N. Esperanza, *Goteborg 298* (LE, M, W). ARGENTINA. NEUQUEN: Hua-Hum at Lago Lacar, *Dawson & Schwabe 2359* (BAA, BAB, MO); San Martín de Los Andes, Dep. Lacar, 10 Feb. 1957, *Hunziker 6909* (BAB); Cascada Maipú, San Martín de Los Andes, 12 Dec. 1946, *Dawson 1358* (BAA, BAB); cerros N of San Martín de Los Andes, 10 Dec. 1946, *Dawson 1257* (BAA, BAB); Lago Lolog, 12 Mar. 1926, *Comber 813* (K), 2 Feb. 1947; Lago Espejo, 7 Feb. 1940, *Cabrera 5976* (NY); Pichi Freful, 17 Feb. 1968, *Cabrera & Crisci 19206* (CONC); Puerto Correntoso, 5 Feb. 1934, *Parodi 11679* (BAA); road Bariloche–Correntoso, 20 Mar. 1939, *Cabrera 5044* (F, GH, NY); Isla Victoria, Parque Nac. Nahuel Huapi, 9 Jan. 1946, *Boelcke 1781* (BAA); Isla Victoria, Zoological Station, 31 Mar. 1946, *de Barba 1122* (LIL); Lago Epilauquén, 4 Feb. 1948, *Dawson & Schwabe 2392* (BAA); Lago Paimún, 5 Feb. 1948, *Dawson & Schwabe 2507* (BAA); Quetrihue, 14 Jan. 1951, *Diem 1774* (BAA, BAB, SI); Villa La Angostura, 30 Mar. 1980, *Diem 3615* (MO; 2n = 44); Lago Tromén, 19 Feb. 1941, *Pérez Moreau s.n.*

(RSA); Laguna Currilafquén, Feb. 1942, *Pérez Moreau s.n.* (RSA); Lago Epulafquén, Feb. 1942, *Pérez Moreau s.n.* (LIL, RSA); Lago Espejo Grande, 2 Mar. 1941, *Pérez Moreau s.n.* (RSA); NE of Lago Quillén, 30 Jan. 1963, *Valla et al. 3121* (BAA, MO); Lago Nahuel Huapi, 14 Feb. 1980, *Ajioka & Vicksy s.n.* (MO); Villa Puerto Manzano, 16 Jan. 1966, *Walter & Walter 708* (B); Brazo Huemul, Lago Nahuel Huapi, 20 Feb. 1979, *Solomon & Solomon 4622* (MO); valley Río Machete, Lago Nahuel Huapi, Feb. 1940, *Pérez Moreau s.n.* (RSA); Bariloche, Isla Victoria, Puerto Pampa, 800 m, 12 Mar. 1934, *Spegazzini s.n.* (BAB, MO). RÍO NEGRO: Puerto Blest to Los Cántaros, 21 Dec. 1944, *Meyer 7431* (DS, MO, NY, S); Puerto Blest, 21 Dec. 1944, *Meyer 7430* (CAS, LIL, MO, NY, S); Puerto Blest, paso de Los Raulies, 20 Jan. 1940, *Pérez Moreau s.n.* (RSA); 5 km below Puerto Blest, 8 Mar. 1914, *Hosseus 1071* (CORD); Puerto Blest, 25 Jan. 1930, *Offermann s.n.* (BAA); Cerro Tronador, 1,200 m, 21 Feb. 1979, *Solomon & Solomon 4639* (MO); road to Tronador, *Castagnet 84* (LP); Lago Mascardí, 8 Feb. 1940, *Pérez Moreau s.n.* (RSA); between Llao-Llao and Bahía López, 23 Mar. 1955, *Fabris 1134* (F); Llao-Llao, *Crespo 161* (SI); Feb. 1940, Bahía López, *Castagnet 54* (LP); Lago Moreno Este, 10 Feb. 1914, *Hosseus 105* (CORD); Laguna Frías, 20 Dec. 1944, *Meyer 7384* (LIL); Lago Frías, Puerto Alegre, 4 Mar. 1941, *Pérez Moreau s.n.* (RSA #45319); Lago Frías, road to Ventisquero Frías, 16 Jan. 1940, *Pérez Moreau s.n.* (RSA); valley of Río Frías, 5 Jan. 1946, *Boelcke 2063* (BAA); Lago Guillermo, 11 Jan. 1945, *Meyer 7789* (UC); Lago Hess, 10 Jan. 1945, *Meyer 8120* (LIL); Península Los Luizos, Dep. Bariloche, 4 Feb. 1914, *Murriey & Rothkugel 73* (BAB); bank of Lago Gutiérrez, Jan. 1957, *Nicora 6450* (BAA); Pampa Linda, 16 Jan. 1943, *Pérez Moreau s.n.* (RSA); Lago Philippi, 14 Feb. 1943, *Pérez Moreau s.n.* (RSA); Lago Martín, 28 Feb. 1941, *Pérez Moreau s.n.* (RSA); Paso Pérez Rosales, Nov. 1941, *Rodríguez s.n.* (RSA); Lago Nahuel Huapi, road to Cerro V. López, 19 Feb. 1979, *Solomon & Solomon 4610* (MO); Puerto Nuevo, Lago Nahuel Huapi, 29 Mar. 1934, *Ljungner 964* (NY); Cascada de Los Alerces, 13 Feb. 1965, *Vuilleumier 202* (GH); El Bolsón, Feb. 1945, *Corvetto 3248* (BAB); near Bariloche, 1 Dec. 1965, *Walter & Walter 479* (B); Bariloche, Colonia Suiza, 12 Mar. 1945, *de Barba 354* (A, NY, SI, UC); region of San Carlos de Bariloche, 1963, *de Lesse 7* (P); Parque Nacional Nahuel Huapi, 5 Jan. 1946, *Boelcke 2063* (K). CHUBUT: Epuyén, Feb. 1937, *Lahitte s.n.* (BAB); Futaleufú, 7 Dec. 1967, *Constance et al. 4157* (BAA); Los Rápidos, Río Futaleufú, 21 Jan. 1945, *Castellanos s.n.* (F, LIL); Colonia 16 de Octubre, Futaleufú, Jan. 1948, *Tschudi s.n.* (LIL); Parque Nacional de Los Alerces, Lago Futalaufquén, 6 Feb. 1955, *Burkart 19851* (MO); Lago Cisne, 10 Feb. 1944, *Pérez Moreau s.n.* (RSA); Valle de las Plumas, Lago General Paz, 2 Mar. 1903, *Gerling 102* (Z); Lago Menéndez, P.N. Los Alerces, Feb. 1944, *Pérez Moreau s.n.* (RSA); Puelo, Dep. Cushamen, Jan. 1939, *Lahitte s.n.* (BAB); Lago Puelo, 14 Feb. 1940, *Pérez Moreau s.n.* (RSA); Anexo Pueblo, 15 Feb. 1961, *Lourteig & Buchinger 194* (P); Cordillera, Jan. 1901, *Burmeister s.n.* (BAB); cerros N of La Comisaría, Feb. 1942, *Pérez Moreau s.n.* (RSA); Los Alerces, 9 Jan. 1948, *Soriano 2885* (BAA). SANTA CRUZ: Glaciar Spegazzini, 50°15'S, 73°15'W, 19 Mar. 1968, *Anliot 6016* (SGO), 19 Jan. 1967, *Boelcke et al. 12612* (BAA, BAB, CONC, P, SI); Santa Cruz, 14 Nov. 1975, *Boelcke 16403* (BAA); S shore of Lago Argentino, 1907–1908,

Furlong 98 (GH, NY, US); Cerro Buenos Aires, near Moreno Glacier, 5 Jan. 1959, *James 669* (BM, DS); Valle León, region of Lago Buenos Aires, 11 Feb. 1939, *von Rentzell 6223* (SI); Mayo Glacier, Cerro Mayo, 14 Feb. 1959, *James 2272* (BM, DS, SI); Punta Bandera, Lago Argentino, 1900–1901, *Prichard s.n.* (BM, K, NY); in front of Ventisquero Moreno, 220 m, 18 Dec. 1950, *Sleumer 1151* (US); Lago Argentino, Glaciar Ameghino, 28 Mar. 1953, *Vervoorst 4785* (MO). TIERRA DEL FUEGO: Río Grande, *Cordini s.n.* (RSA); Isla de Los Estados, 64°00'W, 54°45'S, *Webster s.n.* (G); Estancia Harberton, cultivated from bush said to have been brought from the western Beagle Channel by Thomas Bridges, 25 Mar. 1968, *Goodall 1677* (NA, RNG, UC, US), 8 Nov. 1968, *1836* (NA, RNG, UC, US); Harberton Garden (cultivated), 24 Jan. 1966, *Goodall 298* (LP, RNG).

Representative naturalized specimens. ARGENTINA: San Javier to Villa Nougues, Tucumán, 12 June 1945, *Ortiz s.n.* (NY); road Santa Lucía–Tafí del Valle, 20 Sep. 1944, *Torrent s.n.* (NY). BOLIVIA: Unduavi, La Paz, 8 Apr. 1946, *Llanos 239* (BAB); Chapare, Cochabamba, June 1966, *Cárdenas 6279* (LIL), Apr. 1961, *3969* (LIL); Incachaca, Apr. 1938, *Cárdenas 688* (LIL), Mar. 1941, *2248* (LIL); Toralapa, 18 Dec. 1973, *Cárdenas 3753* (LIL); Ayopaya, Dec. 1935, *Cárdenas 3369* (LIL); Carrasco, Sehuenka, 1964, *Cárdenas 6153* (LIL). COLOMBIA: Macizo de Bogotá, 10 Apr. 1946, *Schultes 7275a* (COL). KENYA: Mt. Kenya forest, 5 Jan. 1967, *Perdue & Kibuwa 8416* (K); Nyeri, 16 Apr. 1971, *Wandumbi School 757* (K). MEXICO: Orizaba, Veracruz, July 1855, *Botteri 1047* (K). MALAYA: Cameron Highlands, 1 Apr. 1976, *T. & P. 612* (K). RWANDA: Kinigi, 5 Aug. 1977, *Runyinga 724* (LG). TANZANIA: Jaegstal, 21 Apr. 1971, *Mshana 170* (K); 2 km E of Lushoto, 26 Dec. 1966, *Semsei 4176* (K). U.S.A. HAWAII: Hawaii, Upper Waiakea Forest Preserve, 580 m, 26 July 1983, *Wagner et al. 4847* (BISH); Hawaii National Park, *Fagerlund & Mitchell 87* (BISH); Volcanoes National Park, Crater Rim Drive, 16 Apr. 1978, *Fosberg 57479* (BISH); near Kilauea Crater, *Degener 1588* (BISH); near Volcano House, 3,900 ft., 1 Sep. 1937, *Neal 946* (BISH); Kauai, Kokee State Park, 3,500 ft., 24 Apr. 1968, *Herbst 1075* (BISH).

Fuchsia magellanica is separated from the Brazilian members of section *Quelusia* by 1,000–1,500 km. Yet it is remarkably similar to those species morphologically and can be best distinguished by its elongated ovary and fruit, relatively long petioles (usually over ¼ the length of the blade), and more dentate leaf margins, which are sometimes shallowly lobed between the teeth. *Fuchsia magellanica* lacks the long, drooping branches of some of the lianoid species from Brazil, and it generally grows as an upright shrub. In cultivation it can also reach treelike proportions and is considered the hardiest (most frost-resistant) of all *Fuchsia* species.

A number of different species and varieties have been recognized by others for what is considered here to be a monotypic species. Two different color varieties have been named for plants that lack the typical red coloration of the floral tube, sepals, leaf

veins, and petioles. One, *F. magellanica* var. *molinae*, comes from the island of Chiloé; the other, *F. magellanica* var. *eburnea*, is from the southern Magallanes Region of Chile. Similarly pale-colored plants are also known from Corral, Prov. Valdivia, Chile (Gunkel 2133, GH). All of these plants occur sympatrically with red-flowered populations of *F. magellanica* and probably result from minor recurring mutations on pigmentation.

Munz (1943: 9) thought that plants from the southern part of the range, which he called *F. magellanica* var. *typica*, had consistently smaller leaves and flowers than those from the north, but this is clearly not the case. Large-leaved plants occur throughout the range of the species. James Solomon (pers. comm.) examined many local populations in Chile and Argentina and found that individuals growing in the sun usually have smaller leaves and flowers than those nearby in shadier sites. Similarly, clines in leaf size and texture occur along climatic gradients, such as that along the shores of Lago Nahuel Haupi in Argentina. The vegetation in that area becomes increasingly xeric from west to east, and plants of *F. magellanica* respond to this gradient by developing lower, more compact plants with smaller, thicker leaves.

Populations of plants with small, densely packed leaves are common on the island of Chiloé, where high levels of humidity predominate throughout the year. Larger-leaved individuals also occur together with these variants. Some of the phenotypic variants of *F. magellanica* may also be genetically determined, as they are known to maintain their distinctive characteristics under uniform growing conditions. In horticultural circles, there has been a strong tendency to assign varietal names to some of these strains.

In this treatment, I am not recognizing any varietal or subspecific taxa under *F. magellanica*, because it is apparent that a great deal of local variation exists over the broad geographical range of the species, without any clear geographical correlations. The species is cytologically uniform, with over 40 populations counted with $2n = 44$. Since most of the present range of the species, south of 44°S latitude, was completely glaciated during the major glacial advances of the Pleistocene (Vuilleumier, 1971), there has probably been very little time for populations to diverge in the southern part of the range.

In his *Flora of Tierra del Fuego*, Moore (1983) cited localities of *F. magellanica* from as far south as the Beagle Channel at 55°S, and west to Staten Island, at 64°W. Collections from these areas were made in the past century, however, and it is un-

likely that the species occurs there naturally today. According to D. Moore (pers. comm.), the introduction of goats on Staten Island early in the last century and the activities of Europeans in the vicinity of the Beagle Channel during the past 100 years have badly deteriorated the woody vegetation of these areas.

On the drier, Argentinian side of the Andean Cordillera, *F. magellanica* occurs natively as far north as the Lago Quillén, at 39°30'S. Northwards, the mountains become increasingly arid. On the Pacific side of the Andes, native populations are found as far north as Concón (32°50'S), just north of Valparaíso. These populations grow close to the coast, along streams in wooded ravines. Looser (1928) found native populations of *F. magellanica* east of Santiago (33°30'S), in the Quebrada de Peñalolén, between 1,450 and 1,750 m, and Navas (1976) reported the species from the nearby Quebrada de Macul.

The northernmost extension of *Fuchsia magellanica* barely overlaps with the southernmost populations of the xeromorphic *F. lycioides* (sect. *Kierschlegeria*) in the vicinity of Concón, north of Valparaíso, Chile. A number of specimens collected in this area during the last century are morphologically intermediate between the two species and may represent interspecific hybrids (see Appendix).

9. ***Fuchsia regia*** (Vellozo) Munz, Proc. Calif. Acad. Sci. IV. 25: 13, pl. 1, fig. 5, 1943. *Quelusia regia* Vellozo, Fl. Flum. 149. 1829; Icon. 4: tab. 6. 1831. LECTOTYPE: The illustration in Tab. 6, Volume 4 of the *Icones of Flora Fluminensis*. Vellozo stated for the type locality: "in the Pharmacopolitan Alps on the way to the town of Cunha," which is located between Paraty and Cunha, in the Serra da Bocaina, near the São Paulo–Rio de Janeiro border, Brazil. According to Borgmeier (1937), Vellozo collected in this area between 1779 and 1787, and the original illustrations were made in the field from live plants.

Erect to generally scandent or climbing shrubs 0.5–5 m tall, or lianas up to 15 m high in trees. Branchlets wine purple, glabrous to puberulent, rarely densely pilose; main branches ascending in small plants, decumbent to drooping and 1–6 m long in large ones. Leaves opposite, or in whorls of 3, 4, or rarely 5, firmly membranous to coriaceous, (narrowly) elliptic-ovate to ovate, 20–140 mm long, 8–70 mm wide, apex acute to acuminate, base acute to rounded, glabrous to pilose on both

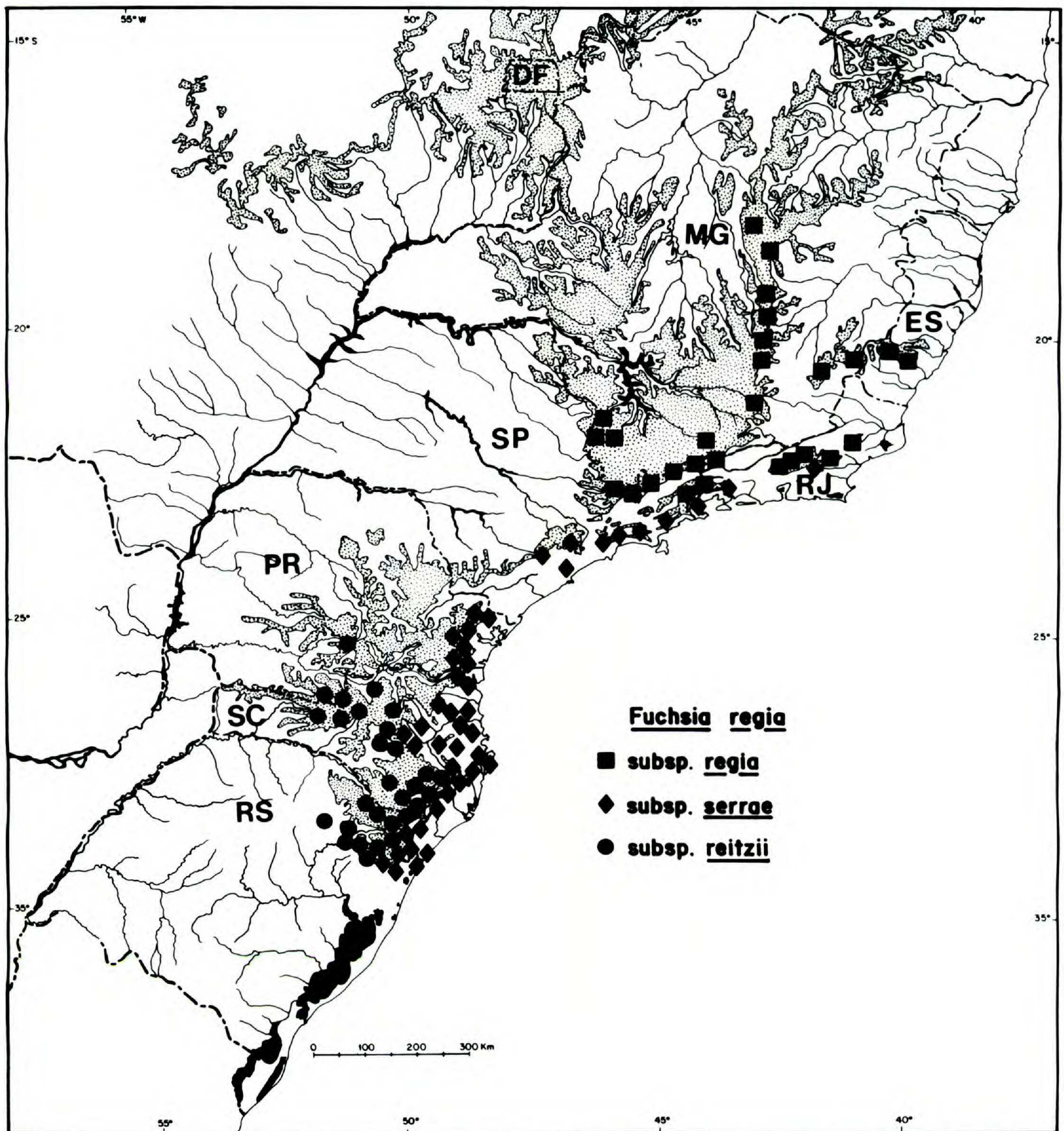


FIGURE 15. Native distributions of the three subspecies of *Fuchsia regia*. Contours higher than 800 m are indicated by the stippled areas. Capital letters are Brazilian state abbreviations. (See caption of Fig. 5.)

surfaces; margin entire to gland-serrate, secondary veins 4–10 per side. Petioles 1–3 mm thick, 3–35 mm long. Stipules triangular, membranous to thick-stubby, 0.8–3 mm long, 0.4–3 mm wide, adjacent ones sometimes fused, usually recurved with age, ephemeral to persistent. Flowers solitary or rarely in pairs in upper leaf axils; pedicels pendulous, 10–55 mm long, usually wine red. Ovary oblong, 5–12 mm long, 2–4 mm wide. Floral tube cylindrical-fusiform, 5–16 mm long, 3–7 mm wide, glabrous to puberulent or pilose outside; nectary smooth or lightly ridged, 2.5–8 mm high. Sepals

15–45 mm long, connate at the base for 3–14 mm; free lobes 3–9 mm wide at base, spreading to recurved or reflexed at anthesis. Tube and sepals red or rose. Petals purple, obovate to spatulate, 10–25 mm long, 8–16 mm wide. Filaments red-purple, 25–45 mm and 20–38 mm long; anthers oblong, purplish, 2–5 mm long, 1–2 mm wide. Style glabrous to pubescent in lower ½; stigma clavate, 2–6 mm long, 1–2 mm wide, exerted 8–25 mm beyond the anthers. Berry oblong, ellipsoid or globose, 10–27 mm long, 9–13 mm thick, dark purple when ripe; seeds tan, oblong to narrowly

triangular, laterally compressed, 1.6–2.5 mm long, 1–1.6 mm wide. Gametic chromosome numbers $n = 22, 44$.

Distribution (Fig. 15). This is the most widely distributed species of *Fuchsia* in Brazil, occurring in the states of Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul from 18°20'S to 29°30'S. Most common between 700 and 2,000 m, on the upper, wettest slopes of ranges such as the Serra do Mar, Serra Geral, Serra da Mantiqueira, and Serra do Espinhaço. *Fuchsia regia* subsp. *reitzii* is associated with the *Araucaria* forests of the southern planalto from Paraná to Rio Grande do Sul. Plants occasionally occur as high as 2,400 m on Mt. Itatiaia and at sea level in coastal restingas of Santa Catarina and Rio Grande do Sul. Flowers mainly from October to April.

This is the most variable of the Brazilian species of sect. *Quelusia*. Three distinct and largely allopatric series of populations can be recognized based on differences in several floral and vegetative characters. They intergrade in areas where their ranges overlap, and the presence of octoploid populations in some or all of the populations sampled in each series is unique in the genus. For these reasons, the different series are treated here as subspecies of *F. regia*.

KEY TO THE SUBSPECIES OF *FUCHSIA REGIA*

- 1a. Sepals strongly connate above the point of insertion of petals and stamens, joined for more than $\frac{1}{3}$ of their total length, the free lobes generally recurved; stipules crassate and persistent, giving a nodose appearance to young stems 9b. subsp. *serrae*
- 1b. Sepals slightly connate at the base, joined for less than $\frac{1}{4}$ of their total length, the free lobes spreading; stipules membranous or thickened only at the base and young stems not apparently nodose.
- 2a. Leaves in whorls of 3–5, membranous, tertiary venation conspicuous; margins gland-serrulate and petioles mostly shorter than 10 mm; floral tubes 5–10 mm long, sepals 17–28 mm long 9c. subsp. *reitzii*
- 2b. Leaves mostly opposite or ternate, subcoriaceous, tertiary venation not conspicuous; margins entire or gland-denticulate and petioles mostly longer than 10 mm; floral tubes 10–16 mm long, sepals 24–45 mm long 9a. subsp. *regia*

9a. *Fuchsia regia* (Vellozo) Munz subspecies **regia**. *Fuchsia regia* (Vandelli) Munz var. *typica* Munz, Proc. Calif. Acad. Sci. IV. 25: 13. 1943. Vellozo's type illustration shows a plant

with narrowly ovate-lanceolate leaves in pairs and threes, and flowers with very shortly connate, long sepals. These characters correspond to the northernmost subspecies, which reaches as far south as the type locality in northern São Paulo state. Figure 16.

Fuchsia integrifolia Cambessèdes in St. Hilaire, Fl. Bras. Merid. 2(17): 273. 1830. TYPE: Brazil. Minas Gerais: "Serra da Caraça, near city of Villa Rica (Ouro Preto) and near São Gabriel," 1819, *Auguste de Saint Hilaire C 80* (holotype, P, with two different branches, the one to the left the type and tagged as C 80, the one to the right with a tag stating "Serra da Caraça," photograph at F; isotypes, P—again with two different branches, the one to the left numbered C 80, F #1008268 "ex P," RB).

Fuchsia pyrifolia K. Presl, Symbol. Bot. 2: 19, tab. 65. 1834. TYPE: Brazil, "ad Rio Janeiro," Presl? (holotype, PRC—445/a).

Shrubs 0.5–5 m tall, occasionally erect but usually scandent, or lianas to 15 m high in trees. Branchlets generally glaucous and wine purple, occasionally loosely to densely pilose, older plants with long hanging branches to 5 m long. Leaves opposite, or in whorls of 3 and 4, subcoriaceous, elliptic to lance-elliptic or ovate, 40–140 mm long, 10–50(–70) mm wide, apex acute to acuminate, base acute to cuneate or rounded, sublustrous green and glabrous to pubescent above, veins often reddish-tinged, paler green and glabrous to pilose below, sometimes with tufts of pilose hairs at the base of the lower midvein; margin subentire to remotely gland-denticulate, secondary veins 6–9(–10) per side. Petioles stout, 2–3 mm thick, canaliculate above, (6–)10–28 mm long, wine purple. Stipules triangular, membranous or thickened at the base, \pm recurved, 0.9–2(–3) mm long, 0.5–1.8 mm wide, adjacent ones sometimes fused, the base usually persistent but the tip deciduous. Flowers solitary in upper leaf axils; pedicels 22–55 mm long, pendulous. Ovary cylindrical, 6–11 mm long, 3–4 mm thick. Floral tube narrowly to broadly cylindrical-fusiform, 10–16 mm long, 4–6 mm wide, glabrous to subpilose outside; nectary smooth to ridged, 5–8 mm high. Sepals 24–45 mm long, narrowly lanceolate, connate at the base for 3–7 mm; free lobes 4–9 mm wide at base, spreading at anthesis. Tube and sepals red to rose. Petals violet, obovate, 13–22 mm long, 10–16 mm wide. Filaments red-purple, 25–44 mm and 23–38 mm long; anthers oblong, 3–5 mm long, 1.5–2 mm wide. Style glabrous to pilose in lower half; stigma red, narrowly clavate, 3.5–6 mm long, 1.2–1.6 mm thick, exserted 10–27 mm beyond the anthers when fully extended. Berry oblong-ellipsoid, purple when ripe, 20–25 mm long, 9–12 mm thick; seeds

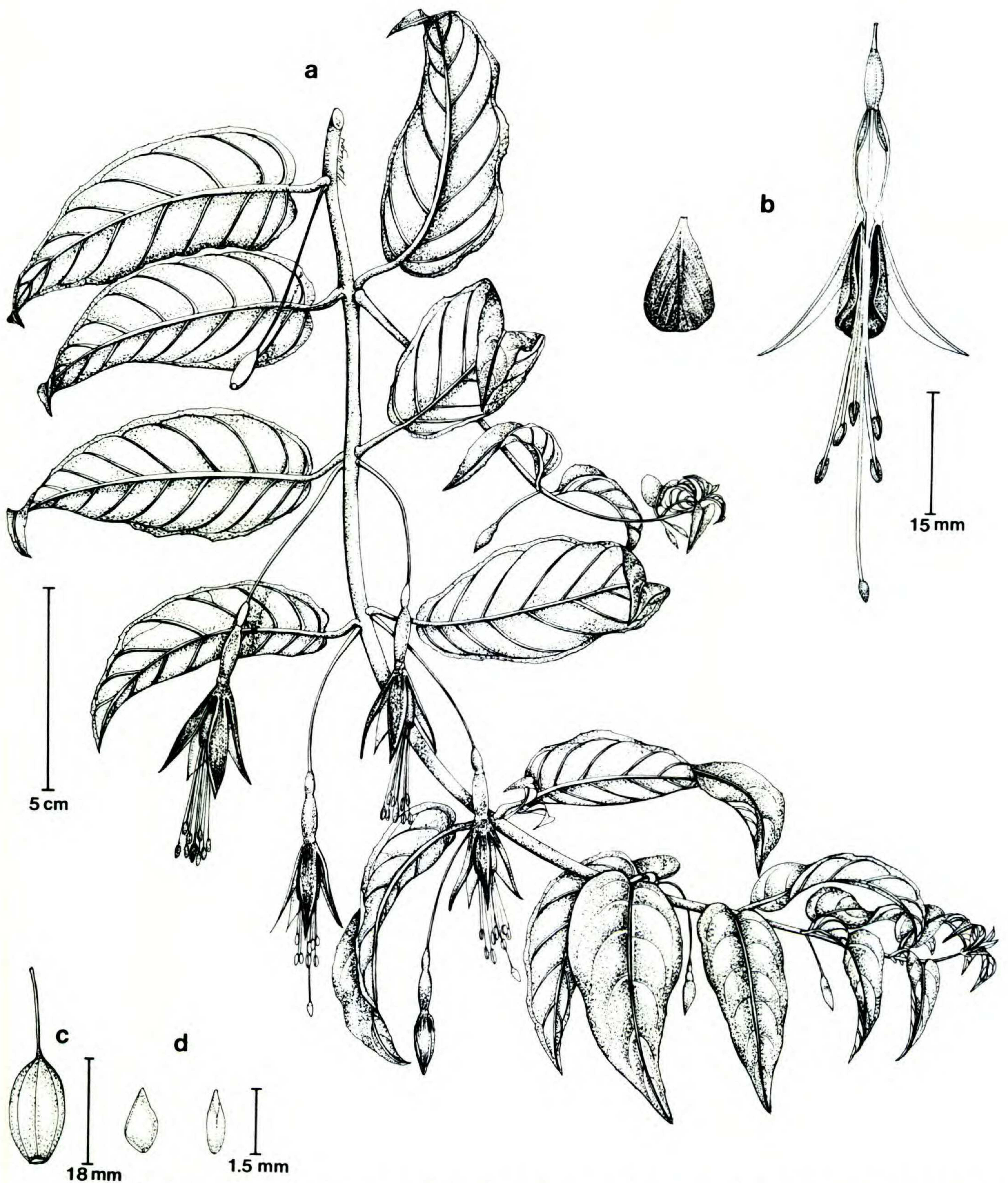


FIGURE 16. *Fuchsia regia* subsp. *regia*.—a. Flowering branch.—b. Longitudinally split flower and individual petal.—c. Slightly immature berry.—d. Seed from (c) in two lateral views. From *Ramamoorthy 683-2*.

1.8–2.8 mm long, 1.2–1.8 mm wide. Gametic chromosome numbers $n = 22, 44$.

Distribution (Fig. 15). In montane cloud forests of the Serra do Mar, Serra do Caparaó, Serra do Espinhaço, Serra da Caraça, Serra da Mantiqueira, Serra da Bocaina, and other subsidiary mountain ranges in Espírito Santo, Minas Gerais, Rio de Janeiro, and northern São Paulo states,

1,000–2,400 m. Flowering mainly from October to April.

Additional specimens examined. BRAZIL. ESPÍRITO SANTO: Pico de Forno Grande, Mun. Castelo, *Brade 19275* (M, RB); km 1 of Domingos–Gerhardt road, Pedra Azul to Domingo Martins, 1,000 m, *Pereira 450* (UEC). MINAS GERAIS: Carangola, Serra da Gramma, *Chase 9579* (US); *Kuhlmann 137* (RB); *Mexia 4278* (A, BM, F, G, GH, MO, NY, UC, US); Serra da Gramma, trail to Araponga,

- Mexia* 4326 (A, BH, BM, F, G, K, MICH, MO, NY, P, PG, S, U, UC, US, Z); Araponga, *Kuhlmann* 33934 (RB); Alto Caparaó, Tronquieras to Vale Verde, *Souza & Marcia* 85 (HBR, RB, US); Tronquieras, Alto Caparaó, *Berry et al.* 4543 (MO, RB; $n = 22$); Vale Verde, Caparaó, *Hatschbach & Ahumada* 31445 (MBM); Pico da Bandeira, close to Caparaó, 1,500–1,600 m, *Shepherd et al.* 5769 (MBM); Macieiras to Fazendinha, Serra Caparaó, *Lanna* 32 (MO); Serra de Macieiras, Caparaó, *Moreira* 47 (R); Rancho das Três Barras, Serra Caparaó, *Santos & Campo in 26 June 1950* (RB); Caparaó Velho, *Torgo* 30 (HB); Serra da Caraça, *Mello Barreto* 7157 (F); *Gounelle in Feb. 1889* (P); Caraça, Tanquinhas, *Grandi & Tales* 165 (BHCB); Ouro Preto, *Berry et al.* 4551, 4552 (MO, RB); *Cochran* 29191 (R, US); *Clausen s.n.* (P); *Macedo* 3078 (MO, US); Morro do Baú, Ouro Preto, *Badini* 25103 (OUPR); Campo Grande, Mun. Ouro Preto, *Badini* 20113 (OUPR); Morro da Queimada, Ouro Preto, *de Lima et al.* 1369 (MO); Camarinhas, *Godoy #106 Esc. Pharmacia* (OUPR); Fonte dos Amores, Mun. Poços de Caldas, *Mello Barreto* 11078 (BHCB); Poços de Caldas, *Barros* 667 (SP); *Hoehne* 2703 (SP); Poços de Caldas, Caixa d'Água, *Santos* 5734 (DS); road Botelho–Poços de Caldas, *Pabst* 9500 (HB, MBM); Caldas, *Araujo s.n.* (R #41685); *Lindberg* 346, 347 (S); *Mosén* 472 (MO, P, S), 473, 4509 (S); *Regnell* 148 (R), *Regnell in 1862* (BR, K, M, NY), *in 1864–1865* (LE, O, R), *in 1846* (P, W), *in 1867*, *in 1871* (S); Caldas, Ribeirão dos Bugres, *Mosén* 474 (S); Serra do Cipó, *Irwin et al.* 20542 (F, K, NY, US); Serra do Cipó, road to Conceição, *Mello Barreto* 8855 (NY, R), 9204 (BHCB), 9254 (F); São João da Chapada, *Irwin et al.* 28499 (MO, NY, US); Pico do Itambé, E slopes, *Anderson et al.* 35830 (MO, NY, RB, US); Serra de Itabira, *Sello s.n.* (LE, S); Rio Acima, Fazenda Gandarela, *Duarte* 926 (HB); Oiro Branco, *Weddell* 1553 (P); Morros do Lobo, no coll. 647 (M); Passa Quatro, Itaguaré, *Brade & Araujo* 1981 (MO); *Vidal* 2120 (R); Fazenda dos Campos, Passa Quatro, *Vidal* 1789 (R); Cidade Azul, Serra da Mantiqueira, Sapucaí-Mirim, *Kuhlmann* 2915 (SP); Delfim Moreira, 7 km from Isópolis, *Mattos* 15397 (SP); São Francisco dos Campos, Alto do Morro do Cabrito, divisória SP-MG, Mun. Delfim Moreira, *Kuhlmann* 2466 (SP); Aguas de Prata, 3 km NW of Cascata, road to São Roque da Fatura, *Mattos & Mattos* 14192 (SP); Aiuruoca, Serra do Papagaio, *Silveira in Nov. 1897* (R #102490); Serra do Picú, *Schwacke in 10 Dec. 1886* (R); Fazenda Santa Alda, Teixeira Soares, *Sampaio in 1944* (R #41684); Fazenda São Benito, Serra da Mantiqueira, *Vidal in Apr. 1949* (R #41684); Hermilio Alves, Cacholina, *Duarte* 2384 (MO); Serra do Itacolomi, Mun. Ouro Preto, *Badini* 23131, 25273 (OUPR); *Barbosa* 1058 (R); *Berry et al.* 4544 (MO, RB; $n = 22$), 4545 (MO, RB); *Claussen* 7 (F, LE, P, RSA); *de Lima* 1307 (MO, RB); *Macedo* 2774 (MO, NY, S); *Magalhaes Gomes* 1744 (OUPR); no locality, *Ackermann s.n.* (BR); *Claussen in June 1840* (BM, BR, F, G, GH, OXF); *Miers* 2433 (US); *Langsdorff s.n.* (LE); *Regnell in 1842* (P, U); *Riedel* 62 (P); *St. Hilaire B¹* 200 (P); *Velho* 4555 (BM, K); *Widgren in 1845* (BR, US). RIO DE JANEIRO: Monte Estrela, *Mieire* 553, *s.n.* (LE); Serra da Estrela, Petrópolis, *Goés* 75 (RB); Serra da Estrela, near Cachoeira de Vêu da Noiva, Correias, Fazenda do Sampaio, *Pabst in 5 Jan. 1964* (HB); Petrópolis, Correias, Serra dos Órgãos, Fazenda Bom Fim, *Carauta* 693 (MO); Serra de Petrópolis, *Duarte* 1163 (RB); *Duarte & Pereira* 4669 (RB); Vale das Videiras, Mun. Petrópolis, *Martinelli & Gurken* 508 (RB); *Martinelli et al.* 169 (MO); Vale das Videiras, Morro da Cuca, *Jouvin* 3 (RB); Petrópolis, road to Fazenda Inglesa, *Rocha & Silva* 14 (R, US); Itaipava, Vale de Cuiaba, Mun. Petrópolis, *Martinelli et al.* 1641 (RB); 26 km from Itaipava, road to Teresópolis, *Berry et al.* 4419 (MO, RB; $n = 44$); Petrópolis–Teresópolis, *Lutz* 1734 (R); Petrópolis–Quitandinha, *Lutz* 1356, 1577 (R); Petrópolis, Araras, Morro Bolo de Milho, *Sucre & Braga* 2808 (RB), Petrópolis–Itamaraty, *Glaziou* 8676 (R); Pati do Alferes, Mun. Petrópolis, *Plowman & Martinelli* 10125 (F); Petrópolis, *Glaziou* 8676 (P); Alto do Imperador, Petrópolis, *Preston s.n.* (K); Serra dos Órgãos, Mun. Petrópolis, *Martinelli et al.* 1749 (RB); Represa dos Guinle, Mun. Teresópolis, *Gentry & Peixoto* 907 (MO, RB); Teresópolis, Parque Nacional Serra dos Órgãos, *Carauta* 1343 (MO); *Frasão* 15265 (RB); *Fromm et al.* 181 (B); *Lanna* 133 (MO); *Lem in 19 Mar. 1964* (NY); *Lott* 12 (MO, RB); *Rodrigues* 53 (R); *Sampaio* 1622 (R); *Santos et al.* 202 (R), 1208 (PEL, R); *Vidal* 11.147, 11.654, 11.6489 (R); *Wawia* 334 (W); Campo dos Antas, Serra dos Órgãos, *Caris in 22 May 1948* (RB); *Emygdio et al. in Mar. 1942* (R); *Pereira* 1917 (RB), 25 July 1949 (HB, MBM); *Santos & Pessoa in 25 Feb. 1942* (R); *Vianna* 429 (R); Serra dos Órgãos, *Araujo* 148 (MO, RB); *Badini* 22136, 22263 (OUPR); *Brade* 16355 (RB); *Burchell* 2327 (BR, K), 2196 (GH, K); *Fromm et al.* 180 (HB); *Gardner* 375 (BM, CGE, F, G—2 sheets, GH, K—2 sheets, NY, OXF, P, TCD, W); *Glaziou & Simart* 3733 (P); *Lusihnath* 835 (LE); *Miers* 3473 (TCD), 4453 (US), *in Feb. 1938* (BM—mixed collection); *Peckolt s.n.* (W); *Wilkes s.n.* (NY, US); Serra dos Órgãos, Castelo, *Brade* 10945 (R); Morro Assú, Serra dos Órgãos, *Vianna* 654 (R); *Brade* 9918 (R); Teresópolis, *Bailey & Bailey* 1296 (BH); Teresópolis to Pedra da Baleia, *Cardoso* 145 (R); Morro da Nova Caledônia, Nova Friburgo, *Berry et al.* 4421, 4425 ($n = 22$), 4432, 4433 ($n = 22$) (all MO, RB); Pico de Frade, Mun. Macaé, *Brade* 15876 (B, RB); *Farney et al.* 621 (RB); Corrisas, *Brade & Aparicio* 18703 (RB); Alto Soberbo, *Gentry & Peixoto* 937 (MO, RB); Itatiaia, Serra da Mantiqueira, including Maceiras and Planalto, *Altamirano & Watter* 71 (M, RB); *Altamirano in 11 Oct. 1945* (PACA), *Aparicio & Edmundo* 829 (RB); *Barth* 1136 (US); *Brade* 17515 (PACA, RB); *Campos Porto* 2773 (B, NY, PACA, RB); *Carauta* 528 (MO); *Dusén* 81 (GH, MO, R, S, W), 650 (S), *in 25 May 1902* (S); *Eiten & Eiten* 6662, 6674 (SP, US); *Emmerich* 53 (R); *Ferreira & Briolando* 184 (RB); *Fromm* 17 (R); *Fromm et al.* 164 (R); *Ginzberger* 142, 143 (F, W); *Hunt* 6418 (K); *Kuhlmann* 26436 (RB); *Lanna* 54 (MO); *Lanstyck* 253 (MO); *Lindeman & Haas* 5203 (U); *Lutz in Jan. 1957* (R); *Markgraf & Brade* 3651 (RB); *Occhioni* 16483 (RB); *Ramamoorthy* 103, 116, 815–823 (MO); *Sampaio* 4784 (R); *Scheinvar* 78 (R); *Ule* 148 (R); Abrigo Rebouças, Itatiaia, *Berry et al.* 4437, 4439 (MO, RB; $n = 44$); *Oliveira* 413 (RB); *Pereira & Pabst* 8222 (HB), 5178 (GH, RB); *Santos* 5034 (US); *Smith* 1476 (GH); *Sucre & Plowman* 5178 (GH, RB); *Walter* 71 (RB); no locality, *St. Hilaire D* 22 (F, P), 800 (P); *Luschnatte s.n.* (OXF). SÃO PAULO: Serra da Mantiqueira, between Itajuba and Guaratinguetá, *Castellanos* 23371 (MO); Pico Itapeva, Campos do Jordão, *Vital & Ramamoorthy* 4860 (MBM); Parque Estadual, Campos do Jordão, *Mattos* 15956-a (SP); Umuarama, Campos do Jordão, *Kuhlmann* 32492 (SP); Campos do Jordão, *Bailey & Bailey* 811 (BH); *Campos Porto* 313 (B, RB), 2991, 2992 (RB), 3233 (MO); *Davis et al.* 3006 (RB, SP, UEC); *de Lima* 1131 (MO); *Emmerich*

15 (HB); *Gonçalves & Kuhlmann* 2169 (SP); *Friedrichs in Jan. 1944* (PACA); *Hashimoto* 313 (SP); *Lanstyack* 33105 (B, RB); *Leite in 1945* (A); *Lutz & Lutz* 1614 (R); *Mattos & Mattos* 14467 (SP); *Pabst* 4212 (F, HB, MBM, RB); *Ramamoorthy & Vital* 673 (MO; $n = 44$), 674 (MBM, MO), 675 (MO), 676 ($n = 44$), 677, 680 ($n = 44$), 682, 684 (MO), 817 (MB), *Sakane* 206, 211 (SP); Serra da Bocaina, *Gibbs et al.* 4573 (F); *Duarte* 7689 (HB, MO); *Handro* 808 (SP); *Ramamoorthy & de Lima* 1172, 1174 (MO); *Vianna* 2949 (R, US); *Viana et al.* 286 (R, US); Serra da Bocaina, Mun. São José do Barreiro, km 16 near Silveiras, *Shepherd & Shepherd* 12858 (SP, UEC); Serra da Bocaina, road to Mambucaba, *Lutz in Apr. 1951* (R #116696); Serra da Bocaina, Sertão da Bocaina, margins Rio Pintado, *Pabst* 4744 (HB, MO); Bananal, Sertão do Rio Vermelho, Serra da Bocaina, *Brade* 15268 (RB); *Brade & Duarte* 20129 (MO). Cultivated in the city of São Paulo: Horto Botânico Cantareira, *Puttemans* 204 (P, SP); Agua Funda, Jardim Botânico do Estado, *Teixeira* 241 (SP); Ypiranga, Jardim Museu Paulista, *Luederwaldt s.n.* (SP); Chácara dos Morrinhos, *Pickel* 4447 (SP).

Fuchsia regia subsp. *regia* is the most widespread of the Brazilian fuchsias, occurring in four different states, centered in Rio de Janeiro and Minas Gerais. As a result of its fragmented distribution, with populations in a number of discrete mountain ranges, considerable morphological differentiation has taken place throughout the range of this subspecies. It is also cytologically heterogeneous, with tetraploid and octoploid populations. All counts made from Minas Gerais and northern Rio de Janeiro have been tetraploid, whereas octoploid and tetraploid individuals occur together in northern São Paulo and south-central Rio de Janeiro states, in areas such as Itatiaia, Serra da Bocaina, and Serra dos Órgãos (see fig. 9 in Hoshino & Berry, 1989). The different cytotypes cannot be distinguished morphologically, however, and their relationships are not well understood.

Fuchsia regia subsp. *regia* can be distinguished from other taxa of sect. *Quelusia* by having large flowers with spreading sepals and only slight sepal connation, large leaves with petioles generally longer than 10 mm, and mostly glabrous stems and foliage.

This subspecies has a particularly broad ecological tolerance, extending from tall cloud forest at 1,000 m to open campos as high as 2,400 m. When it occurs inside the forest, *F. regia* subsp. *regia* grows as a liana, flowering when its branches reach sufficient light in the tree canopies. As the vegetation decreases in height with greater elevation, it grows as a scandent shrub, and as a short, erect shrub when found on the edges of the open campos. This gradual transition in the habit of subsp. *regia* has been observed in several localities, such as the Serra dos Órgãos and the Morro da

Nova Caledônia in Rio de Janeiro, and the Serra do Itacolomi and Serra do Itambé in Minas Gerais.

As a result of its broad altitudinal and geographical distribution, *F. regia* subsp. *regia* occurs sympatrically with four other species from sect. *Quelusia*. In each case, morphologically intermediate individuals have been found that indicate the occurrence of interspecific hybridization (see Appendix). It also occurs sympatrically with *F. regia* subsp. *serrae* in northern São Paulo along the eastern slopes of the Serra da Bocaina, where it forms hybrid populations, with further intergradation southwards along the Serra do Mar as far as Caraguatatuba. These populations are discussed in the Appendix.

Several collections of *F. regia* subsp. *regia* from widely distant localities are unusually pubescent yet do not appear to be the result of hybridization or introgression with pubescent species growing nearby, such as *F. alpestris* or *F. coccinea*. The specimen *Campos Porto* 3421 (RB, from Campos do Jordão, São Paulo, 1,600 m) is similar in all morphological features to nearby glabrous populations of *F. regia*, but the entire plant is covered by a dense, pilose indumentum. Three collections from Minas Gerais are similarly pubescent: *Gardner* 4555 (K), *Claussen* 88 (G), and *Brade* 16953 (RB, US, from the Serra do Caparaó). *Martinelli et al.* 169 (RB, Vale das Videiras, Petrópolis, Rio de Janeiro) is covered by short, fine pubescence, which is unusual among the populations of *F. regia* from Rio de Janeiro. These pubescent variants are apparently quite rare, and none were found during my fieldwork in Brazil.

9b. *Fuchsia regia* subsp. *serrae* P. Berry, subsp. nov. TYPE: Brazil. Paraná: Mun. Morretes, Recanto Eng^o Lacerda, Estrada da Graciosa, 850 m, 28 Jan. 1985, *P. E. Berry, T. Plowman & F. Juarez* 4493 (holotype, MO; isotype, MBM; $n = 44$). Figure 17.

Fuchsia affinis Cambessèdes, Fl. Bras. Merid. 2(17): 274. 1830. TYPE: Brazil. Paraná: "in forest near Ferraria, district of Curitiba," May 1820, *Auguste de Saint Hilaire* C² 1622 (lectotype, P, here designated; isotype, P, with no number). The lectotype sheet contains two different specimens, but the branch corresponding to *St. Hilaire* 1622 is clearly marked on the left side; it was annotated, possibly by St. Hilaire, and labeled as the type collection of *F. affinis*.

Fuchsia radicans Miers in Lindley, Bot. Reg. 27: pl. 66. 1841. TYPE: Brazil. Rio de Janeiro: Organ Mts., *John Miers in Feb. 1838* (holotype, BM; isotype, K). There are two sheets of Miers collections labeled as *F. radicans* at BM; one sheet contains three different plants, but the holotype has only one specimen on its sheet, with a pasted blue slip stating

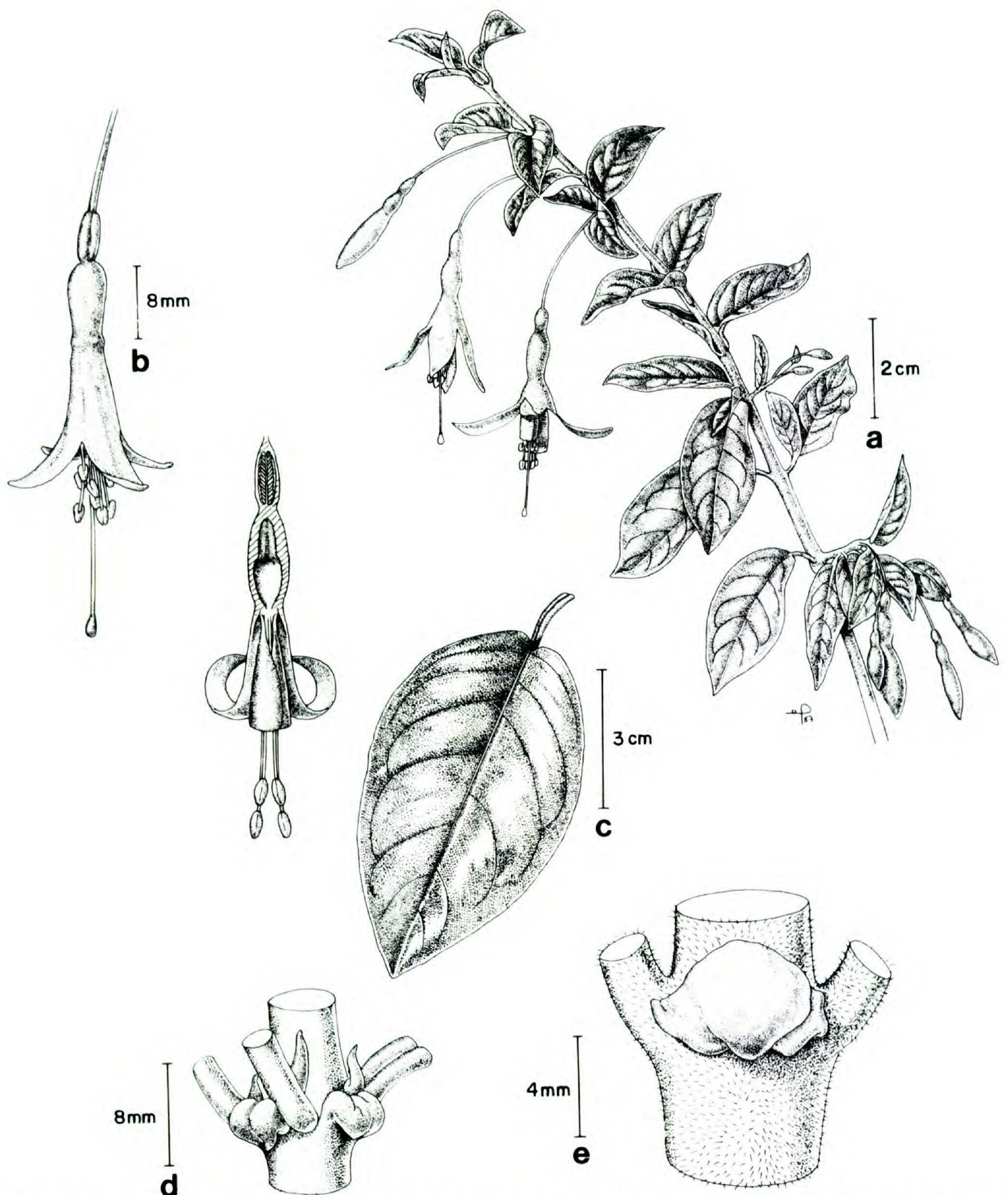


FIGURE 17. *Fuchsia regia* subsp. *serrae*. — a. Flowering branch. — b. Flower. — c. Detail of upper surface basal leaf. — d, e. Details of crassate, persistent stipules. From Berry *et al.* 4492.

“*Fuchsia radicans* Nob., Organ Mts., Feb., 1838”
and a small typeset label of “Herb. John Miers.”

Frutex 1–4 metralis aliquando in arboribus scandens usque ad 15 m, ramulis plerumque subtiliter puberulentibus interdum dense pilosis, lateralibus saepe brevibus divaricatisque. Folia opposita vel 3–4 verticillata, coriacea, (anguste) ovata ellipticave, margine subintegro, petiolis 1.5–3 mm crassis (7–)10–35 mm longis, stipulis prominentibus incrassatis recurvatis 2–3 mm longis latisque, ca. 0.5 mm crassis, contiguis interdum connatis, facie nodosis. Tubi florales cylindrico-fusiformes (6–)7–

15 mm longi, sepalis (15–)19–34 mm longis, (4–)5–7 mm latis, basi (5–)8–14 mm connatis, lobis patentibus saepe recurvatis vel raro reflexis. Bacca oblonga 16–26 mm longa, 9–13 mm crassa, seminibus 2–2.5 mm longis, 1–1.5 mm latis. Numerus gameticus chromosomatum $n = 44$.

Scandent to climbing shrubs 1–4 m tall, or lianas to 15 m high in trees. Branchlets generally finely puberulent, sometimes subglabrous or densely short-pilose, the lateral ones often short and divaricate; older branches on large plants hanging, to 6 m long, with basal stems to 6 cm diam. Leaves op-

posite or in whorls of 3–4, coriaceous, (narrowly) ovate to elliptic, (35–)60–110 mm long, (15–)25–45 mm wide, apex acute to acuminate, base rounded to acute and sometimes \pm uneven, smooth and lustrous dark green above, pale below, glabrous to lightly pubescent on both surfaces; margin subentire, secondary veins 5–8(–10) per side. Petioles 1.5–3 mm thick, usually dull purple, canaliculate above, (7–)10–24(–35) mm long. Stipules prominent, crassate, 2–3 mm wide, 2–3 mm long, ca. 0.5 mm thick, recurved, persistent, adjacent ones sometimes fused, drying tan-colored and giving a nodose appearance to the stems. Flowers solitary in upper leaf axils; pedicels 20–45 mm long, pendulous. Ovary cylindrical, 6–12 mm long, 2–4 mm wide. Floral tube cylindrical-fusiform, (6–)7–15 mm long, 3–7 mm wide, glabrous to puberulent outside; nectary \pm smooth, 5–8 mm high. Sepals (15–)19–34 mm long, connate at the base for (5–)8–10(–14) mm and forming a long, usually 4-ridged sepal tube, the free lobes (4–)5–7 mm wide at base and spreading to most often recurved or rarely reflexed at anthesis. Tube and petals bright red. Petals violet, obovate to spatulate, 11–20 mm long, 8–15 mm wide. Filaments red, 22–48 and 20–40 mm long; anthers red-purple, 3–4 mm long, 1.5–2 mm wide. Style red, glabrous to pilose near base; stigma red, clavate, 2–4 mm long, 1–2 mm wide, exserted 15–23 mm beyond the anthers. Berry oblong, 16–26 mm long, 9–13 mm thick, purple when ripe; seeds 2–2.5 mm long, 1–1.5 mm wide. Gametic chromosome number $n = 44$.

Distribution (Fig. 15). Typical of dense cloud forests on the crest and wet, coastal escarpments of the Serra do Mar and Serra Geral, in Rio Grande do Sul, Santa Catarina, Paraná, São Paulo and southern Rio de Janeiro states, from 500 to 1,450 m. Also found at lower elevations on the top of isolated “morros” in the Atlantic coastal forest of Santa Catarina, or rarely occurring near sea level in coastal restingas in northern Rio Grande do Sul and southern Santa Catarina. Flowering mainly from November to March, occasionally in other months.

Additional specimens examined. BRAZIL. RIO DE JANEIRO: Cachoeira de Macacú, road to Nova Friburgo, *Sucre & Soderstrom* 9044 (MO, RB); Angra dos Reis, Alto da Serra, 600 m, *Sucre et al.* 4908 (MO); RJ-16, Rio Claro, first tunnel, 550 m, *de Lima* 270 (RB); Organ Mountains, *Gardner in Mar.* 1841 (BM), *Ramamoorthy & de Lima* 1181 (MO); Province of Rio de Janeiro, *St. Hilaire B* 2475^{er} (P). SÃO PAULO: Alto da Serra, above Caraguatatuba, *Ramamoorthy & Vital* 685, 686 (MO), 688 (MO; $n = 44$); Parque Estadual de Caraguatatuba, *Gentry & Zardini* 49376 (MO); Alto da Serra de Pa-

ranapiacaba, *Emygdio* 1520 (R); Serra de Cubatão, *Guillemín* 470 in 1839 (P); Alto da Serra, São Paulo to Santos, *Pabst & Pereira* 5750 (HB, MBM); *Vidal in Apr.* 1937 (R #35043); Alto da Serra, *Hoehne* 7617 (A); *Mattos* 11714 (MBM); *Munz* 15415 (F, G, GH, NY, POM, US); *Sandeman* 2012 (K, OXF); *Smith* 1900 (F, GH, S); *Wettstein & Schiffner in May* 1901 (W); Santos, *King s.n.* (G); Sallesópolis, *Travassos* 314 (MO, RB); Est. Campo Grande, *Hoehne* 11894 (POM); Borraçeira Exper. Station, *Nascimento in 4 Feb.* 1943 (UC); road to Atibain, *Monteiro et al.* 4894 (F); near San Bernardo, *Wettstein & Schiffner in July* 1901 (W); Cantareira, *Hoehne* 1477 (SP); Rio Grande, estrada do Mar, *Hauff* 120 (SP); Serra do Mar, between Mogi das Cruzes and Bertioga, *Kirizawa et al.* 552, 1015, 1038 (SP); km 74 of SP-98 from Mogi to Bertioga, Mun. Biritiba-Uçu, *Pirani & Yano* 730 (SP); Miracatu, Sítio Urupuã, km 348.5 of BR-116, *Martuscelli* 4 (SP); Reserva Capão Bonito, 70 km from Itapetininga, SP-139, *Sakane* 543 (SP); Reserva Carlos Botelho, between São Miguel Arcanjos & Sete Barras, *Prance et al.* 6871 (MBM), 6896 (F); no locality, *Burchell* 3742 (BR, K); *Kuhlmann s.n.* (RB). PARANÁ: Santa Ana, Mun. Bocaiúva do Sul, *Hatschbach & Guimarães* 23408 (M, MBM, MO); Jaguatirica, Mun. Bocaiúva do Sul, *Ramamoorthy & Vital* 124 (MO); Serro, Mun. Bocaiúva do Sul, *Hatschbach* 42976 (MBM); Serra Capivari, Mun. Campina Grande do Sul, *Oliveira & Oliveira* 867 (MBM); 7–12 km W of Sesmaria and Rio Capivari, *Berry et al.* 4446, 4447, 4449, 4450 ($n = 44$) (all MBM, MO); Sítio do Belizário, Mun. Campina Grande do Sul, *Hatschbach* 16426 (MBM); Papanduva, Mun. Campina Grande do Sul, *Hatschbach* 7091 (MBM); Curitiba, *Hoehne* 23109 (POM); *Dusén in 12 Jan.* 1914 (F, GH, MO, NY, SP, US), in 20 Oct. 1928 (SP); Parque Nova Iguaçu, Mun. Curitiba, *Berry et al.* 4455, 4456 (MBM, MO); *Kummrow* 1294 (MBM); 10 km E of Curitiba, *Lindeman & Haas* 2539 (MBM); km 34 road Curitiba-Paranaguá, *Fromm et al.* 304 (R); *Pabst et al.* 5876 (HB, MBM); Rio da Santa, Curitiba to Joinville, *Conrad & Dietrich* 2055, 2056 (MO); Rio Taquary, Mun. Quatro Barras, *Berry et al.* 4492 (MBM, MO; $n = 44$); *Hatschbach* 19942 (MBM); *Oliveira* 577 (MBM); Serra de Araçatuba, Mun. Guaratuba, *Hatschbach* 7082 (MBM); Alto da Serra, Mun. Guaratuba, *Kummrow* 1914 (MBM); Pico Abrolhos, Mun. Morretes, *Curiel in 14 Apr.* 1947 (MBM #39718); *Hatschbach* 751 (PACA); Mun. Morretes, *Ramamoorthy & Hatschbach* 828 (MBM), 829 (MO; $n = 44$, $2n = 88$), 830 (MO; $n = 44$); Pilão de Pedras, Mun. Morretes, *Kummrow* 1917 (MBM); Piraquara, *Hatschbach* 188 (PACA); Serra do Emboque, Mun. Piraquara, *Hatschbach* 24946 (MBM, UC); Rio Pequeno, Mun. São José dos Pinhais, *Hatschbach* 8019 (HB, U); São José-Colônia Murici, Mun. São José dos Pinhais, *Saito* 404 (A); Malhada, Mun. São José dos Pinhais, *Hatschbach* 39764 (MBM, NA); Colônia Roseira, Mun. São José dos Pinhais, *Hatschbach* 17657 (MBM, UC); Guaricana, Mun. São José dos Pinhais, *Oliveira* 518 (MBM, MO); *Hatschbach* 34905 (MBM); Zinco, Mun. São José dos Pinhais, *Oliveira* 534 (MBM); Barro Preto, Mun. São José dos Pinhais, *Oliveira* 153 (MBM); Serra do Mar, *Braga* 550 (MO, RB, US); Alto da Serra, Mun. Sete Barras, *Hatschbach* 26892 (MBM, NA); Pirai, Mun. Tijucas do Sul, *Hatschbach* 40187 (BH, MBM); Serra do Mar, desvio Ypiranga, *Dusén in 19 Sep.* 1908 (BR, G, GH, LE, MICH, MO, PH, S, UC, Z); Vossoroca, Mun. Tijucas do Sul, *Kummrow* 329 (MBM); Rincão, Mun. Tijucas do Sul, *Hatschbach* 40471 (MBM). SANTA

CATARINA: Rio Novo, Mun. Aguas Mornas, *Klein & Bresolin 10547* (HBR); Faxinal, Biguaçu, Mun. Antônio Carlos, *Reitz C956* (HBR, MO, PACA, RB); *Rambo 50392* (PACA); Fazenda Coprowsky, Alto Bendito Novo, Zinco, Mun. Benedito Novo, *Bresolin & Rocco 683* (HBR); Morro Spitzkopf, Mun. Blumenau, *Reitz & Klein 9202* (CM, G, HBR, MO); *Smith & Reitz 6279* (HBR, R, RSA, US); Morro do Barão, Mun. Botuverá, *Reitz & Klein 18015* (HBR, MO, RSA); Morro da Bateia, Mun. Brusque, *Reitz C1914* (HBR, MO, US); Morro do Iquererim, Mun. Campo Alegre, *Smith & Klein 7384* (HBR, MO, R, RSA, US); Morro do Ribeirão, Mun. Florianópolis, *Klein 7166* (FLOR, HBR, MO, RSA); Lajeado Alto, Guabiruba, *Souza et al. 609, 613, 620, 621, 625* (FLOR); Monte Crista, São Francisco do Sul, Mun. Garuva, *Reitz & Klein 10027* (HBR, MO, RSA); Hôrto Florestal, Mun. Ibirama, *Klein 1975* (F, HBR, MO, PACA, RSA); Alto Cachoeira Grande, Aguas Mornas, *Klein & Bresolin 10751* (HBR); Morro do Baú, Mun. Itajaí, *Reitz 2104* (HBR, MO, RSA, US); Morro da Fazenda, Mun. Itajaí, *Reitz & Klein 1740* (HBR, MO, RSA), *1875* (MO); Joinville, *Schwacke 4961* (R, RB); Joinville, estrada Dona Francisca, *Reitz & Klein 4220* (HBR, MO, RSA); Morro da Ressacada, Mun. Itajaí, *Klein 1868* (HBR, MO, S, US); Serra da Pedra, Mun. Jacinto Machado, *Reitz C318* (GH, HBR, MO), *856* (PACA); Serra do Malhacoco, Praia Grande, Mun. Jacinto Machado, *Reitz C1456* (GH, HBR, MO); Encruzilhada a Serril, Mun. Lajes, *Lourteig 2287* (DS, HBR, NY, P, R, US); Serra Geral-Encruzilhada, Mun. Lajes, *Smith & Klein 8020* (HBR, MO, R, RSA, US); Pinhal da Companhia, Mun. Lauro Müller-Uruçanga, *Reitz & Klein 2849* (HBR, MO, UC, US); Bom Jardim da Serra, descent of Serra Geral to Lauro Müller, *Berry & Falkenberg 4520, 4521* (MBM, MO); *Falkenberg 2317* (FLOR, MO); Braço Joaquim, Mun. Luiz Alves, *Reitz & Klein 2685* (B, BR, HBR, K, MO, RSA); Octacilio Costa, *Pereira & Pabst 8016* (HB, M, PEL, RB); Anitópolis, Mun. Palhoça, *Klein 491* (HBR, MO, RSA, UC); Morro do Cambirela, Mun. Palhoça, *Klein & Bresolin 9297* (FLOR, HBR, MO); *Rambo 50332* (PACA); Serra da Boa Vista, São José, Mun. Rancho Queimado, *Reitz & Klein 5485* (HBR, MO), *10727* (HBR, MO, RSA); Rancho Queimado, road to Boa Vista, *Ramamoorthy & Reitz 1159, 1160* (MBM, MO); Boa Vista, *Ramamoorthy & Reitz 1163* (MBM, MO), *1167, 1168* (MO); Takuartas, near Boa Vista, *Ramamoorthy & Reitz 1164, 1165* (MO); Rio dos Bugres, *Schwacke in 5 July 1885* (P); Serra do Matador, Mun. Rio do Sul, *Reitz & Klein 7321* (G, HBR, MO, NY, UC, US); km 195–203 of road Rio do Sul–Curitibanos, Mun. Pouso Redondo, *Berry & Falkenberg 4501* ($n = 44$), *4502, 4504* ($n = 44$) (all MBM, MO); *Falkenberg 2318, 2321, 2322, 2325* (FLOR); slopes of Serra Geral from Itaimbezinho to Praia Grande, *Falkenberg 2370, 2376, 2377* (FLOR); *Falkenberg et al. 3750, 3751* (FLOR), *3752* ($n = 44$; FLOR); above Turvo to Serra da Rocinha, Mun. Timbé do Sul, *Matzenbacher 398* (ICN); 13–19 km above Timbé do Sul to Serra da Rocinha, *Falkenberg et al. 3753* ($n = 44$), *3754, 3755* (FLOR); Serra da Rocinha, border RS and SC states, 22 km above Timbé do Sul, *Falkenberg et al. 3756, 3757, 3760, 3761, 3766* (FLOR); Cerro Azul, Mun. Timbó, *Berry & Falkenberg 4500* (MBM, MO); 0.5–4 km E of escarpment of Serra Geral between Uribici and Braço do Norte, *Falkenberg et al. 3792–3796* (FLOR); 1–2 km W of escarpment of Serra Geral, towards Uribici, *Falkenberg et al. 3788–3791* (FLOR); NE of Uribici, km 90 of road to Braço do Norte, *Falkenberg et al. 3783, 3785* (FLOR); Sabiá, Mun. Vidal

Ramos, *Reitz & Klein 4274* (HBR, MO, NY, RSA, UC, US), *6657* (F, HB, HBR, MBM, MO, PACA, PEL, RSA); Sombrio, 10 m, Mun. Sombrio, *Reitz C1131* (MO, RSA #79111). RIO GRANDE DO SUL: Torres, Faxinal, 10 m, *Waechter 827* (ICN #41273); Josafá, Mun. Cambará do Sul, *Falkenberg 2339, 2341, 2343, 2345, 2347, 2349, 2350, 2354, 2357, 2372, 2378* (FLOR); Itaimbezinho, Parque Nacional Aparados da Serra, *Falkenberg 258, 270, 274, 278, 352, 356, 401* (FLOR); *Falkenberg et al. 3749* (FLOR); *Lindeman & Haas in 3 Dec. 1971* (F, ICN #9359, U); *Pedralli & Rego in 24 Apr. 1983* (FLOR); *Rambo 4310* (PACA), *45524* (MO), *45529* (PACA), *49363* (RSA), *53983* (B, RB, S), *58552* (B, HBR, MO, S); 20 km E of Tainhas on RS-020 to Terra de Areia, *Falkenberg et al. 3744* ($n = 44$), *3745* (FLOR); Serra da Rocinha, Aparados da Serra, *Rambo 8630* (PACA); Cambará, near São Francisco de Paula, *Rambo 36222* (ICN, PACA); Serra do Faxinal, near São Francisco de Paula, *Rambo 32099* (PACA); Fortaleza, Mun. Cambará do Sul, *Wasum & Wasum 2122* (US); *Wasum et al. 734* (US).

Fuchsia regia subsp. *serrae* is the only taxon in sect. *Quelusia* besides *F. brevilobis* with the sepals connate for over one-third of their length. It is unique in its persistent, crassate stipules and lustrous, subcoriaceous leaves with thick petioles. Unlike the other subspecies of *F. regia*, the sepals are usually recurved at anthesis and four-angled in bud.

This subspecies is most common along the crest and upper slopes of the “serras,” the steep and very wet region on the eastern edge of the southern Brazilian planalto as it drops abruptly to the Atlantic coastal plains. The rugged terrain, with sheer drops of 800 m or more, such as those found in the Aparados da Serra in northern Rio Grande do Sul, creates a broad diversity of microhabitats reflected in the large degree of variability in different populations of this subspecies. For example, low, densely branched subshrubs characteristically grow in rock crevices on the steep drop-offs of the Aparados, while tall lianas with long, drooping branches are found in more protected, forested areas near the crest of the Serra.

The degree of sepal connation varies considerably in different parts of the range of *F. regia* subsp. *serrae*. In northern Paraná, where it occurs together with the long-tubed *F. brevilobis*, the sepals are often joined for half or more of their length. Along the Serra Geral in southern Santa Catarina and Rio Grande do Sul, however, the sepals are less joined than populations further north; in extreme cases, individuals like *Falkenberg 3744* and *3745* have the sepals joined for only 4–6 mm, but their thick, shiny leaves and nodose stipules are characteristic of subsp. *serrae*.

Along the edge and just inland from the steep drop-offs of the Serra Geral in Rio Grande do Sul

and southern Santa Catarina, a sharp ecotone occurs between the drier, flatter planalto and the wet, steep coastal slopes. In this area, *Fuchsia regia* subsp. *serrae* occurs sympatrically with the easternmost populations of *Fuchsia regia* subsp. *reitzii*, and the two subspecies intergrade extensively in areas such as Itaimbezinho, Serra da Rocinha, and the edge of the Serra Geral near Uribici and Bom Jardim da Serra in Santa Catarina. Further discussion and a list of intermediate, probable hybrid individuals between these two subspecies is found in the Appendix.

Towards the northern limits of the range of *Fuchsia regia* subsp. *serrae*, this subspecies also contacts populations of *Fuchsia regia* subsp. *regia*, especially in the Serra da Bocaina in northern São Paulo state. Populations of subsp. *serrae* predominate there on the lower, coastal slopes below 1,100 m, while subsp. *regia* occurs at higher elevations and further inland. Extensive intergradation between these two subspecies occurs on the upper coastal slopes of the Serra, where unusually pilose individuals are also found. Some of these individuals are octoploid, as in all the southern populations of subsp. *serrae*, while others are tetraploid, like some of the populations of subsp. *regia* from the Bocaina range and further north (Hoshino & Berry, 1989). Although *F. regia* subsp. *regia* reaches its southern limit at the Serra da Bocaina, populations of *Fuchsia* with mixed ploidy levels and dense pubescence occur south of the Bocaina area as far as Ubatuba in the Serra do Mar of north-central São Paulo state (Hoshino & Berry, 1989).

Fuchsia regia subsp. *serrae* also occurs sympatrically with *F. brevilobis* in several localities in Paraná. Although *F. regia* is octoploid in this area, and *F. brevilobis* is tetraploid, the occurrence of morphologically intermediate individuals indicates that hybridization has taken place between these taxa (see Appendix). The unusually long sepal tubes of populations of *F. regia* subsp. *serrae* in this area are characteristic of *F. brevilobis* and may be the result of introgression with this species.

Outside of its typical montane habitats, *F. regia* subsp. *serrae* has also been found in coastal restingas at sea level, near the Rio Grande do Sul-Santa Catarina border. Reitz (1961) first detected this apparent anomaly in the distribution of typically montane taxa, and found it to occur in at least ten other species that normally occur along the crest of the Serra Geral. The presence of these species in the restingas must represent recent chance introductions from the nearby serras, as the coastal plains of this area are only of Quaternary age (Klein, 1984).

9c. *Fuchsia regia* subsp. *reitzii* P. Berry, subsp. nov. TYPE: Brazil. Santa Catarina: Município São Joaquim, Fazenda de Laranja, São Joaquim, 1,400 m, 13 Jan. 1959, P. Raulino Reitz & Roberto Klein 8135 (holotype, UC #240288; isotypes, B, BR, G, GH, HBR, ICN, K, NY, U). Figure 18.

Fuchsia pubescens Cambessèdes in St. Hilaire, Fl. Brasil. Merid. 2(17): 275, tab. 134. 1830. TYPE: Brazil: "in fields near the Rio Yapó in the part of São Paulo Province called Campos Geraes," currently in Paraná, Municípios Pirai do Sul and Jaguariaíva, May 1820, Auguste de Saint Hilaire C² 1545 (holotype, P, on the same sheet with a small piece of St. Hilaire 2276, which is *F. coccinea* from Minas Gerais; isotypes, P, as St. Hilaire C¹ 1545 and also mixed with 2276, MPU). The holotype at P was annotated as the type specimen of *F. pubescens*, and Cambessèdes's illustration shows the verticillate leaves and flower and round fruits characteristic of *F. regia* subsp. *reitzii*. The other collection from Minas Gerais cited by Cambessèdes in his protologue is *F. coccinea*.

Frutex erectus scandensve 1–4 metralis, ramulis purpurascentibus subglabris vel dense puberulentibus vel pilosis ferruginescentibus, ramis cito excorticatis. Folia 3–4(–5) verticillata, elliptica ad anguste ovato-elliptica, apice acuta basi acuto-acuminata obtusave, nervis tertiariis conspicuis, margine glanduloso-serrulato, petiolis 3–7(–15) mm longis, stipulis lanceolatis membranaceis 0.8–1.4 mm longis. Flores verticillati, tubis floralibus cylindrico-fusiformibus 5–11 mm longis, sepalis anguste lanceolato-oblongis 17–28 mm longis, basi 2–6 mm connatis sub anthesi patentibus, petalis obovatis 10–15(–20) mm longis, 7–13 mm latis. Bacca globosa vel interdum ellipsoidea 10–16 mm longa, 9–12 mm lata, seminibus 1.6–2 mm longis, 1–1.3 mm latis. Numerus gameticus chromosomatum $n = 44$.

Erect to scandent shrubs 1–3 m high, or climbers in trees or brush to 4 m tall. Young branches purplish, subglabrous to densely puberulent or pilose, the pubescence ferruginous in some plants; older stems with reddish to pale tan, readily exfoliating bark. Leaves in whorls of 3 or 4(–5), firmly membranous, (narrowly) elliptic to narrowly ovate-elliptic, 20–65(–90) mm long, 7–20(–40) mm wide, acute at the apex, acute to attenuate or obtuse at the base, dark dull green and subglabrous above, pale green and subglabrous to densely pubescent below with conspicuous tertiary venation, margin serrulate, usually with prominent glandular teeth ascending apically at a $\pm 45^\circ$ angle, secondary veins 5–8 per side. Petioles 3–7(–15) mm long. Stipules lanceolate, 0.8–1.4 mm long, 0.4–1 mm wide, thick at the base, purple, drying dark, divergent to recurved with age, with apiculate, semi-persistent tips. Flowers solitary or sometimes 2 per leaf axil, near branch tips; pedicels slender, 10–

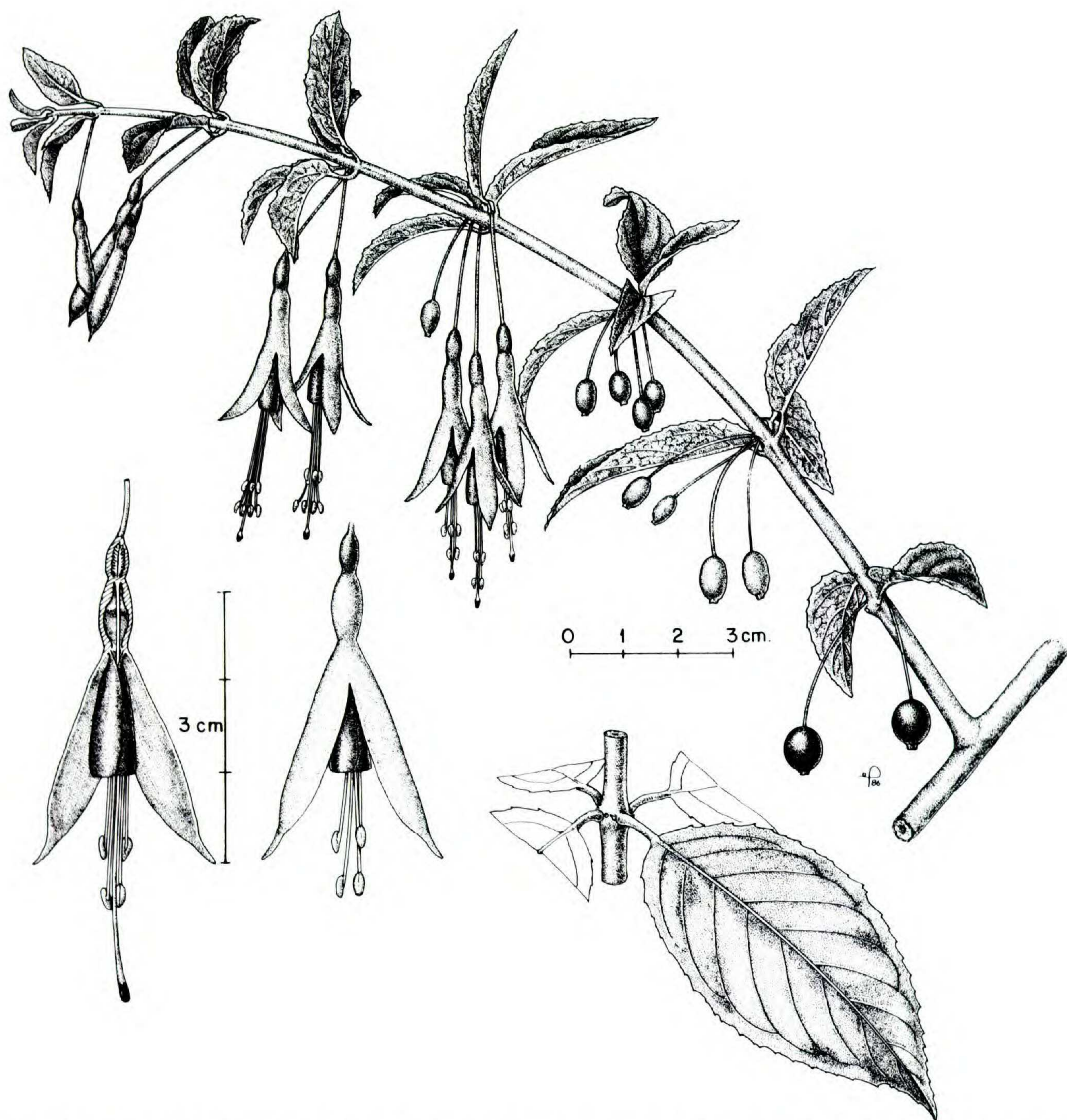


FIGURE 18. *Fuchsia regia* subsp. *reitzii*. Flowering branch, detail of flowers, and detail upper surface of basal leaf. From Berry *et al.* 4512.

35(–50) mm long, pendulous. Ovary oblong, (4–)5–9 mm long, 2–4 mm wide. Floral tube cylindrical-fusiform, 5–9(–11) mm long, 2–4(–6) mm wide, subglabrous to puberulent or loosely pilose outside, glabrous inside; nectary smooth, 2.5–5 mm high. Sepals 17–28 mm long, narrowly lance-oblong, connate at the base for 2–6 mm; free lobes 3–5(–6) mm wide at base, subacuminate at the apex, spreading at anthesis. Tube and sepals red. Petals purple, obovate, 10–15(–20) mm long, 7–13 mm wide. Filaments reddish, 25–45 mm and 20–38 mm long; anthers red-purple, oblong-elliptic, 2–2.5 mm long, 1–1.5 mm wide. Style glabrous to pilose in lower half; stigma clavate, 2–2.5 mm long, 1–1.5 mm wide, exserted 5–15 mm beyond the anthers. Berry globose to ellipsoid, shiny dark

purple when ripe, (10–)12–16 mm long, 9–12 mm wide; seeds tan, 1.6–2 mm long, 1–1.3 mm wide. Gametic chromosome number $n = 44$.

Distribution (Fig. 15). Occurring principally in low wooded areas and usually along streams or seepages, on the planalto west of the Serra Geral and Serra do Mar in south-central Paraná, Santa Catarina, and Rio Grande do Sul, at 880–1,730 m. At the top of the escarpments of the coastal mountain ranges subsp. *reitzii* intergrades with *F. regia* subsp. *serrae*. Flowers mainly from November to March.

Additional specimens examined. BRAZIL. PARANÁ: General Carneiro, *Hatschbach et al.* 13670 (U); 10 km N of Palmas, Mun. Palmas, *Hatschbach et al.* 28175,

28237 (MBM); Cachoeira dos Turcos, Mun. Guarapuava, *Hatschbach* 25602 (MBM). SANTA CATARINA: Campo de Palmas, Mun. Agua Doce, *Smith & Klein* 13421 (FLOR, HBR, MO, NY, RSA, SI, US); BR 153, Rio Roseira, 18 km S of Horizonte, Mun. Agua Doce, *Krapovickas & Cristóbal* 33693 (CTES); 30 km S of Horizonte, *Smith & Klein* 13421 (HBR); 8 km N of Caçador, Mun. Caçador, *Smith & Klein* 8966 (HBR, MO, RSA, US); 12 km N of Caçador, *Smith & Klein* 9145 (HBR, MO, R, RSA, US); 9–17 km W of Bom Jardim da Serra to São Joaquim, Mun. Bom Jardim da Serra, *Berry et al.* 4510 ($n = 44$), 4511, 4512, 4513 ($n = 44$) (all MBM, MO); *Falkenberg* 2269, 2270, 2273, 2275, 2277, 2279, 2280 (FLOR); 9 km E of Bom Jardim da Serra on road to Lauro Müller, Mun. Bom Jardim da Serra, *Berry et al.* 4514–4516 (MBM, MO); *Falkenberg* 2285, 2288 (FLOR); Bom Jardim da Serra, *Eskuche* 1639-63 (SI); 5 km E of São Joaquim, Mun. São Joaquim, *Falkenberg et al.* 3774–3776 (FLOR); road São Joaquim to Uribici, *Falkenberg et al.* 3777 (FLOR; $n = 44$); Uribici, slopes and near summit of Morro da Igreja, *Falkenberg et al.* 3778–3782 (FLOR); Uribici, km 90 of road to Braço do Norte, *Falkenberg et al.* 3786 (FLOR); 0.5–1.5 km N of Várzea, road to Bom Jardim, *Falkenberg et al.* 3771, 3772 (FLOR); Marombos, Mun. Curitibanos, *Klein* 3287 (HBR, MO, RSA); Curitibanos, *Berry et al.* 4506 (MBM, MO; $n = 44$); *Falkenberg* 2247 (FLOR); 5 km W of Curitibanos on BR-470, *Berry et al.* 4508 (MBM, MO); *Falkenberg* 2253 (FLOR); Campo dos Padres, Mun. Bom Retiro, *Rambo* 60135 (PACA); *Reitz* 2342 (G, HBR, NY, U, UC, US), 5213 (PACA); *Smith & Klein* 7652 (HBR, MO); Moratá, Ponte Miriad, *Reitz* 4698 (RSA, S); 11 km E of Faxinal dos Guedes, *Smith & Klein* 11853 (HBR, MO, R, RSA, US); descent of Serra Geral from Bom Jardim to Lauro Müller, *Berry et al.* 4518 (MBM, MO); *Falkenberg* 2305, 2307 (FLOR); 22 km above Timbé do Sul, Serra da Rocinha, Mun. Timbé do Sul, border with Rio Grande do Sul, *Falkenberg et al.* 3758, 3759, 3763–3765 (FLOR); Bituruna, Fazenda Etienne, *Mello Filho* 752 (R); BR-2, km 280, *Pabst et al.* 6132 (HB, MBM, R); *Pereira & Pabst* 6305 (RB); near Lajes, Mun. Lajes, *Lindeman & Haas* 3703 (U); *Texeira & Texeira* 3 (SP); *Rambo* 49602 (MO, RSA, S); Campo de Areão, Mun. Sta. Cecília, *Reitz & Klein* 14185 (HBR, MO, RSA); Ponte Alta do Sul, Mun. Ponte Alta, *Reitz & Klein* 11294 (HBR, MO, US); São Francisco de Malta, Mun. São Joaquim, *Reitz* 6662 (HB, HBR, MBM, MO, RSA); Fazenda de Laranja, São Joaquim, *Smith & Klein* 7652 (HBR, R, RSA, US); 8 km NE of São Joaquim to Cruzeiro, *Smith & Klein* 10277 (HBR, MO, R, RSA, US); Poço Preto, near Rio Timbó, Mun. Porto União, *Smith & Reitz* 8670 (HBR, MO, R, RSA, US); 8 km SW of Fuck on BR-116, *Davidse et al.* 11076 (MO, SP). RIO GRANDE DO SUL: Itaimbezinho, Parque Nacional Aparados da Serra, Mun. Cambará do Sul, *Falkenberg* 361, 362, 2360 (FLOR); *Jarenkow in* 6 Feb. 1983 (FLOR); *Rambo* 49363 (PACA, RSA), 45585 (PACA), 53981 (SI); *Pirani & Yano* 840 (SP); Tainhas, Mun. Cambará do Sul, *Vianna in* 10 Feb. 1957 (ICN #1674); 10–11 km N of Tainhas on RS-020, *Falkenberg et al.* 3746 ($n = 44$), 3747, 3748 (FLOR); 1–4 km N of Post Fiscal, NW of Serra da Rocinha, *Falkenberg et al.* 3767 ($n = 44$), 3768, 3769 (FLOR); 1 km N of Silveira, *Falkenberg et al.* 3770 (FLOR); 219 km N of Porto Alegre, *Lindeman & Haas* 3734 (MBM); Serra da Rocinha, border RS-SC, Bom Jesus to Turvo, *Lindeman & Haas* 9389 (ICN, U); *Rambo* 53880 (B); *Sehman* 4278

(B, PACA, SI); Bom Jesus, *Falkenberg* 1234 (FLOR); Ausentes, Bom Jesus, *Falkenberg* 1182, 1183 (FLOR); Cambará do Sul, *Falkenberg* 263, 1119 (FLOR); *Rambo* 36223 (ICN); Faxinal, Mun. Cambará do Sul, *Bonatto & Lima in* 2 Apr. 1083 (FLOR); *Stehmann* 450 (FLOR); *Sobral* 2813 (FLOR); Esmeralda, Est. Ecol. Aracuri, *Jarenkow* 60 (FLOR); Bom Jesus, Aparados da Serra, *Pabst* 10201 (RB); *Rambo* 8787 (PACA); Rio dos Touros, near Bom Jesus, *Rambo* 8552 (PACA); Capela de São José, Aparados da Serra, Bom Jesus, *Smith & Klein* 5914 (R, US); Cambará, São Francisco de Paula, *Rambo* 36223 (PACA, S); Fazenda Bernardo Velho, Aparados da Serra, Bom Jesus, *Rambo* 34864 (PACA, S); Aparados da Rocinha, Bom Jesus, *Rambo* 45354 (PACA, S), 32487 (PACA); Passo do Guarda, Bom Jesus, *Rambo* 51857 (PACA, S, US); Fazenda Englert, near São Francisco de Paula, *Rambo* 54635 (B, PACA); near Montenegro, *Rambo* 2204 (PACA); Agua Azul, near Caxias, *Henz in* 3 Jan. 1947 (PACA #33277); Cerro do Umbu, near Osório, *Rambo* 1284 (PACA); Caracol, near Canela, *Emrich in* 6 Mar. 1946 (PACA #33277), *in* 22 Mar. 1954 (PACA #54247); *Rambo* 11998 (PACA); Vila Oliva, near Caxias, *Rambo* 31024 (PACA), 31270 (R), 53880 (PACA), 56621 (PACA), 55021 (B, PACA); Passo do Socorro, near Vacaria, *Rambo* 51576 (PACA, S), 51665 (PACA); 25 km N of Vacaria, *Pedersen* 12739 (MO); 10 km S of Vacaria, *Lindeman & Haas* 3734 (U); Fazenda da Ronda, near Vacaria, *Rambo* 34864 (PACA, SI); Taimbé, São Francisco de Paula, *Sehnem* 5125 (SI); Farroupilha, *Camargo* 980 (PACA); Santa Rita, near Farroupilha, *Rambo* 40172 (CAS, PACA, RSA), 45781 (MO, PACA, S), 45782 (PACA); Flores de Cunha, *Schultz* 667 (ICN); Soledade near Passo Fundo, *Rambo* 50039 (PACA); Jaquirana, São Francisco de Paula, *Rambo* 51968 (PACA); Gramado-Cascata do Caracol, *Schweiger in* Feb. 1924 (ICN #44812); Laje de Pedra, Canela, *Miotto* 50 (ICN); Arroio Tatiuí, near Vila Assis, km 193 of BR-386, *Miotto et al.* 184 (ICN); São Francisco de Paula, *Ferreira et al.* 628 (ICN); no locality, *Waechter* 1942 (ICN); *Rambo* 9943 (PACA).

Fuchsia regia subsp. *reitzii* is distinguished by its whorled, membranous leaves with gland-serrate margins and a matte surface having more noticeable tertiary venation than the other subspecies of *F. regia*. Compared with *F. regia* subsp. *serrae*, the only other *Fuchsia* that grows near populations of subsp. *reitzii*, the sepals are much less joined and spreading (instead of recurved), the stipules are much less prominent, the leaf bases are more acute, and the berries are rounder. This subspecies is named in honor of P. Raulino Reitz of the Herbario Barbosa Rodrigues, Itajaí, Santa Catarina, who has made great contributions to the knowledge of the flora of Santa Catarina.

Subspecies *reitzii* is restricted to the planalto west of the coastal mountain ranges of southernmost Brazil. Its overall distribution in this area parallels that of *Araucaria angustifolia*, although it does not tolerate the shade of the dense conifer forests. Both species extend as far east as the edge of the coastal escarpments but end abruptly there

and do not appear on the seaward slopes or in the lower, coastal forest (Hueck, 1953).

Along the eastern edge of the planalto, where sharp drop-offs usually occur down to the Atlantic lowlands, the range of *F. regia* subsp. *reitzii* overlaps with *F. regia* subsp. *serrae*, which extends up from the moist, coastal slopes of the serras. A great deal of intergradation and variation exists in the *Fuchsia* populations of these areas, especially at the crest itself and just inland of the steep drop-offs. In some instances, the extreme local variability is indicative of hybrid swarms, while in other sites, odd variants are found that can extend beyond the normal limits of variation of either subspecies (see Appendix).

A number of unusually pubescent individuals, usually with conspicuously tan or ferruginous hairs, occur in populations near the southern and western extremes of the range of subsp. *reitzii* in Rio Grande do Sul. Collections from the Farroupilha area, such as *Rambo* 45781, 45782, and 40172 and *Carmargo* 980, are uniformly pubescent, while others, such as *Rambo* 31024 from Vila Oliva near Caxias, and *Rambo* 51576 from Passo do Socorro near Vacaria, occur together with more typical subglabrous individuals of the subspecies.

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APPENDIX. Natural hybrids in
Fuchsia sect. *Quelusia*

The main criterion used in detecting hybrids was the morphological intermediacy of several characters. In all cases, the putative parents were known to occur nearby.

1. *F. magellanica* × *F. lycioides*

F. macrostemma var. *parviflora* W. J. Hooker, *Bot. Misc.* 3: 309. TYPE: Chile. Valparaíso, 1832, *Bridges* 199 (holotype, K—Benth.; isotype, CGE).

Specimens examined. CHILE. V REGION (VALPARAÍSO): Valparaíso, *Bertero 1006* (G, GH); in valleys near Valparaíso, *Bridges s.n.* (CGE, K—Hook.).

Representative cultivated specimens. CHILE: Juan

Fernández Islands, Más Atierra, *Meyer 9551* (MO). U.S.A. California: Berkeley, *Bracelin 1422* (BM). ZIMBABWE. Salisbury, *Biegel 5549* (K).

Fuchsia lycioides belongs to a different section, *Kierschlegeria*, and differs widely from *F. magellanica* in its small, alternate leaves, spinose leaf bases, smaller flowers with included stamens and reflexed sepals, and generally occurs in much drier habitats. Both species are tetraploid (Hoshino & Berry, 1989) and have been shown to be closely related by chloroplast DNA restriction site analysis (Sytsma & Smith, 1988). The ranges of the two species barely overlap in the hills around Valparaíso, where several natural hybrids were collected in the early 1800s. These plants are characterized by small flowers with larger, convolute petals than those of *F. lycioides*. The leaves are larger and more often opposite than in *F. lycioides*, with the characteristic dentation of *F. magellanica*. They also lack the spinose leaf bases typical of *F. lycioides*. The natural habitats where the early hybrids were collected have probably been totally eliminated by urban growth.

Hybrids of these two species appear quite often in cultivation and have sometimes been confused with the true *F. lycioides*, as in the cytological study of Chaudhuri (1956).

2. *F. regia* subsp. *regia* × *F. alpestris*

Specimens examined. BRAZIL. RIO DE JANEIRO: Pedra Dubois, Santa Maria Madalena, *Santos Lima & Brade 14240* (B, RB); *Plowman & de Lima 12885* (F, MO).

Both parental species occur locally on Pedra Dubois; the specimens cited above are intermediate in their short, fine pubescence, petiole length (6–10 mm), and flower size (floral tubes 10–12 mm long).

3. *F. regia* subsp. *serrae* × *F. brevilobis*

Specimens examined. BRAZIL. SÃO PAULO: Reserva Carlos Botelho, between Sete Barras and São Miguel Arcangel, 800 m, *Prance et al. 6896* (MBM). PARANÁ: 13 km W of Sesmária and Rio Capivari, Mun. Bocaiúva do Sul, 815 m, *Berry et al. 4448* (MBM, MO; $n = 44$); road from Eng^o. Lange train station and Prainhas, 310 m, *Cordeiro et al. in 16 Jan. 1987* (MBM; $n = 22$).

Fuchsia brevilobis is sympatric with *F. regia* subsp. *serrae* over most of its range but usually grows at lower elevations. These taxa are unique in the section in having their sepals connate for more than one-third of their length, but *F. brevilobis* has more membranous leaves that are narrower, shorter-petioled, and more pubescent than *F. regia* subsp. *serrae*, while the latter has more

prominent, persistent stipules. The flowers of *F. regia* subsp. *serrae* also differ from *F. brevilobis* in their four-ridged buds, glabrous, nitid surface, and flaring sepal tube. The intermediate individuals cited above are from three different localities where the parent species are locally present. In the Capivari locality, the same hummingbird was observed visiting flowers of both species in succession.

Further experimental work on artificial hybrids of these two taxa is desirable, since only tetraploid counts have been obtained from *F. brevilobis*, and all individuals examined of *F. regia* subsp. *serrae* have been octoploid (Hoshino & Berry, 1989). The count obtained from *Cordeiro et al. in 16 Jan 1987* was tetraploid, indicating that it may only be a variant of *F. brevilobis*, and that of *Berry et al. 4448* was octoploid, as found in *F. regia* subsp. *serrae*.

4. *F. regia* subsp. *regia* × *F. campos-portoi*

Specimens examined. BRAZIL. RIO DE JANEIRO: Itatiaia, just above Hotel Brocken-Holsene, road to Abrigo Rebouças, 2,340 m, *Berry et al. 4440* (MO, RB; $n = 22$); Itatiaia, Agulhas Negras, *Lanstyck 253* (RB #61360).

Fuchsia campos-portoi is endemic to the high-altitude campos of Mount Itatiaia and is very distinctive in its small, narrow, strongly serrate leaves and small, short-tubed flowers. *Fuchsia regia* is common in forests at lower elevations on the same mountain range and occurs together with *F. campos-portoi* in thickets near the treeline above 2,200 m. Both specimens cited above are intermediate in leaf size, number of secondary veins, and floral features, such as the ratio of tube to sepal lengths. Meiosis in buds of *Berry et al. 4440* was normal, with the same chromosome number as recorded in local parental populations.

5. *F. regia* subsp. *regia* × *F. coccinea*

Specimens examined. BRAZIL. MINAS GERAIS: Serra do Itacolomi, near base of Pico do Itacolomi, 1,500–1,700 m, *Badini 22451* (OUPR); *Berry et al. 4546* ($n = 22$), 4547, 4548 (MO, RB); *Falkenberg 3380* (FLOR); *Mello Barreto 9168* (R); Serra da Caraça, *Mello Barreto 7157* (BHMH).

Fuchsia coccinea typically grows in thickets amid the rocky, open campo of the highest peaks in Minas Gerais. On the Serra do Itacolomi, fire has destroyed much of the woody vegetation on the highest slopes; *F. coccinea* is now very rare in that area, and intermediate forms with *F. regia* are common. In the series of *Berry 4545–4550* and *Falkenberg 3380–3387*, some of the individ-

uals were treated under *F. coccinea*, but several of them show signs of introgression with *F. regia*, such as leaves that are larger or more coriaceous and rounder-based than individuals of isolated populations of *F. coccinea*. The collections cited above are clearly intermediate between the two species in key characters, such as petiole length, degree of leaf pubescence, and leaf shape. Both species are tetraploid in this locality, and the one hybrid examined cytologically was tetraploid with normal bivalent formation.

Both species are also known together from the Pico do Itambé, farther north in the Serra do Espinhaço. Although the collections of *Anderson et al.* 35832 and *Furlan et al.* 3058 were treated under *F. coccinea*, they both have unusually thick leaves for that species, as well as rounded rather than cordate leaf bases; these traits may be the result of introgression with sympatric populations of *F. regia*.

6. *F. regia* subsp. *regia* × *F. glazioviana*

Specimens examined. BRAZIL. RIO DE JANEIRO: Morro da Nova Caledônia, outskirts of Nova Friburgo, 1,810–1,950 m, *Berry et al.* 4424, 4427 (MO, RB), 4429 (RB), 4430 (MO, RB; $n = 22$).

As in the previous two cases, *F. glazioviana* is a local, high-elevation endemic that is sympatric with *F. regia* near the former's lower altitudinal limits. *Fuchsia glazioviana* has small, densely packed leaves and smaller, narrower flowers than *F. regia*. Most of the hybrids were found along roadsides in cleared areas, and one large patch of variable individuals was seen in an exposed area near the upper limit of the cloud forest. Local populations of both species are tetraploid, as was the one intermediate individual counted.

7. *F. regia* subsp. *serrae* × *F. regia* subsp. *regia*

Specimens examined. BRAZIL. SÃO PAULO–RIO DE JANEIRO BORDER AREA: Reserva Florestal da Bocaina, *Succe et al.* 2932 (AAU, MO, RB, US); Serra da Bocaina, road to old Estação de Fruticultura (now IBDF park HQ), *Duarte* 7689 (MO, RB); *Handro* 807 (SP); *Ramamoorthy & Vital* 1176 (MO; $n = 44$); Bananal, Rio Bonito, Serra da Bocaina, 1,000–1,100 m, *Martinelli et al.* 7779 (RB); Bananal, Sertão do Rio Vermelho, E of Bocaina, *Brade* 15269 (RB); Sertão Bocaina, *Pabst* 4744 (MO).

Populations of *F. regia* subsp. *serrae* and subsp. *regia* converge and intergrade extensively on the upper, seaward slopes of the Serra da Bocaina, close to the Rio de Janeiro–São Paulo border. *Fuchsia regia* subsp. *regia* reaches its southernmost limits in the Serra da Bocaina, occurring mostly at altitudes of 1,100–1,550 m on both sides

of the Serra. *Fuchsia regia* subsp. *serrae* occurs exclusively on the lower, seaward slopes of the same range between 500 and 1,150 m, part of an almost continuous distribution down the coastal slopes of the Serra do Mar and Serra Geral as far as Rio Grande do Sul.

Varied intermediate forms between the two subspecies occur between 1,150 and 1,350 m on the upper slopes of the Serra da Bocaina, along the road from Cunha to Paraty. Most of the fuchsias in this area, including those cited in the above list, are unusually pubescent for *F. regia*. The degree of sepal connation and the thickness and persistence of the stipules, which generally distinguish these taxa, vary widely between individuals in this area, whereas populations higher up on the Serra and further inland are largely glabrous and fall well within the normal range of variation of *F. regia* subsp. *regia*. Hoshino & Berry (1989) reported tetraploid and octoploid individuals of *Fuchsia* from this area, further indicating the intergradation of the basically octoploid subsp. *serrae* and the mostly tetraploid subsp. *regia*. Hexaploid hybrids should be sought in mixed populations.

Although *F. regia* subsp. *regia* is not found further south in São Paulo, more populations of aberrant or intermediate individuals occur as far south as the Serra do Mar above Ubatuba, approximately 60 km south of the Bocaina massif. Tetraploid and octoploid individuals occur side by side at the Alto da Serra near the crest of the mountain (Hoshino & Berry, 1989), again with the unusual pubescence for *F. regia* and considerable variability in such traits as the degree of stipule development. In most other features, however, these individuals resemble *F. regia* subsp. *serrae* more closely than subsp. *regia*.

8. *F. regia* subsp. *serrae* × *F. regia* subsp. *reitzii*

Specimens examined. BRAZIL. SANTA CATARINA: top of Serra Geral and escarpments, km 22–25 from Lauro Müller to Bom Jardim da Serra, 1,270–1,450 m, *Berry et al.* 4517, 4519 (MBM, MO); *Falkenberg* 2302 (FLOR); Rio Caveiras a Lajes, *Lutz in* 29 Dec. 1949 (R #116687); Serra da Rocinha, border of Santa Catarina and Rio Grande do Sul, 1,250–1,280 m, 22 km above Timbé do Sul, *Falkenberg et al.* 3762 (FLOR, MO; the whole series of *Falkenberg et al.* 3756–3766 is a variable series of mostly intermediate variants); *Rambo* 4604 (PACA); NW of Urubici, km 90 of road to Braço do Norte, 950 m, *Falkenberg et al.* 3784 (FLOR, MO). RIO GRANDE DO SUL: Itaimbezinho, Aparados da Serra, *Falkenberg* 261, 264, 275, 354, 357 (FLOR); *Pirani & Yano* 839 (SP); *Rambo* 49363, 50150 (PACA); Caracol, near Canela, *Emrich in* Feb. 1951 (PACA 50187); *Lindeman & Haas s.n.* (ICN #21790); 18 km N of Canela, Salto da Ferradura, *Schultz s.n.* (ICN #21032); Bom Jesus, *Fal-*

kenberg 1150 (FLOR); Taimbé, São Francisco de Paula, Rambo 49363 (SI); Fazenda Bernardo Velho, Aparados da Serra, Bom Jesus, Rambo 34864 (SI).

Both of these two subspecies are morphologically and ecologically distinct over most of their ranges, with *F. regia* subsp. *reitzii* confined to thickets in the southern planalto and *F. regia* subsp. *serrae* inhabiting the wet, seaward slopes of the coastal mountain ranges. *Fuchsia regia* subsp. *serrae* has nitid, subcoriaceous leaves with thick stipules and flowers with strongly connate, recurved sepals, while subsp. *reitzii* has thinner, more whorled leaves with serrate margins, thin stipules, and flowers with spreading, slightly connate sepals.

A narrow ecotone occurs all along the crest of the Serra do Mar and the Serra Geral in Santa Catarina and Rio Grande do Sul as the high rolling plains end and the steep coastal ranges drop abruptly to the Atlantic lowlands. Along this belt, which occurs sometimes just at the crest of the ridges and other times extends a few hundred meters or several kilometers inland, the two subspecies of *F. regia* converge and intergrade in a bewildering variety of variants, some of them exceeding the normal limits of variation of either parental subspecies.

The narrowest ecotone observed was at the Serra da Rocinha, on the Santa Catarina–Rio Grande do Sul border. In this area, the planalto is covered right to the edge by grassy campos, followed by steep drop-offs covered by a special “Aparados”

flora adapted to the persistent rains and mists from the rising coastal air masses (Rambo, 1956). Along the rim of the serra cliffs, between 1,250 and 1,280 m, hybrid swarms of *F. regia* subsp. *serrae* and *reitzii* occur together with occasional plants that can be distinguished as parental, such as those included in the collection series of *Falkenberg et al.* 3756–3766.

Other areas where similar series of intermediates have been observed and collected include the Aparados da Serra at Itaimbezinho, in Rio Grande do Sul, and the area around the crest of the Serra Geral between Bom Jardim da Serra and Lauro Müller in Santa Catarina. Near the town of Urubici, Santa Catarina, plants of *F. regia* subsp. *serrae* occur farther inland from the crest of the Serra Geral, around the base of the Morro da Igreja and Campo dos Padres, the highest points in Santa Catarina. Where the two subspecies occurred sympatrically, as in the collection series of *Falkenberg et al.* 3787–3791 (FLOR, MO; just W of the crest of the ridge between Urubici and Braço do Norte, at 1,030 m), some unusual variants of subsp. *serrae* were found with flowers less than half the normal size (#3790).

Both subspecies are octoploid and are characterized by variable numbers of multivalents during meiotic metaphase (Hoshino & Berry, 1989); the one intermediate individual examined had the same chromosome number and type of meiotic configuration.